TM 9-2330-339-13

TECHNICAL MANUAL
OPERATOR AND FIELD MAINTENANCE MANUAL
FOR

SEMITRAILER, TANK, 5000 GALLON, BULK HAUL, SELF LOAD/UNLOAD
M967A1
NSN 2330-01-155-0046 (EIC CVW)
M967A1P1
NSN 2330-01-531-4059 (EIC C5M)

SEMITRAILER, TANK, 5000 GALLON, FUEL DISPENSING, AUTOMOTIVE
M969A1
NSN 2330-01-155-0048 (EIC CVY)
M969A1P1
NSN 2330-01-527-4879 (EIC C5P)
M969A2
NSN 2330-01-377-9337 (EIC CW2)
M969A2P1
NSN 2330-01-527-4880 (EIC C5Q)

SEMITRAILER, TANK, 5000 GALLON, FUEL DISPENSING UNDER/OVERWING AIRCRAFT
M970A1
NSN 2330-01-155-0047 (EIC CVX)

SUPERSEDURE NOTICE: This manual supersedes TM 9-2330-356-14 dated 26 October 1990, TM 9-2330-398-10 and TM 9-2330-398-24 dated 15 June 1996, including all changes.

DISTRIBUTION A - Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY, WASHINGTON, D.C.
31 DECEMBER 2015

WARNING SUMMARY

This warning summary contains general safety and hazardous materials warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in serious injury or death to personnel. Also included are explanations of safety and hazardous materials icons used within the technical manual.

FIRST AID

FOR FIRST AID INFORMATION, FM 4-25.11.

EXPLANATION OF SAFETY WARNING ICONS

EAR PROTECTION - headphones over ears shows that noise level will harm ears.

ELECTRICAL - electrical wire to arm with electricity symbol running through body shows that shock hazard is present.

ELECTRICAL - electrical wire to hand with electricity symbol running through hand shows that shock hazard is present.

EQUIPMENT RUNAWAY - human figure being run over by equipment shows that the potential for injury is present if equipment moves or rolls back on its own.

FLYING PARTICLES - arrows bouncing off face with face shield show that particles flying through air may harm face.

FALLING PARTS - box with arrow pointing down shows that falling parts present a danger to life or limb.

WARNING SUMMARY - Continued

EXPLANATION OF SAFETY WARNING ICONS - Continued

HEAVY OBJECTS - human figure stooping over with lines above the back shows physical injury potential from improper lifting technique.

HEAVY PARTS - foot with heavy object on top shows that heavy parts present a danger to life or limb.

HOT AREA - hand over area radiating heat shows that part is hot and can burn.

MOVING PARTS - hand with fingers caught between gears shows that the moving parts of the equipment present a danger to life or limb.

SAFETY ALERT SYMBOL - indicates a potential personal injury hazard.

WARNING SUMMARY - Continued

GENERAL SAFETY WARNINGS DESCRIPTION

WARNING

- The following procedure can be used when air reservoir cannot be recharged. Use extreme care when caging brakes. Semitrailer wheels must be blocked to prevent serious injury to personnel or damage to equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Wipe excess lubricant from the area of brake shoe linings to prevent grease from soaking the linings. If brake shoe linings become soaked, have Field Maintenance replace them. Failure to follow this warning may cause brakes to malfunction. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- The following procedure can be used when air reservoir can be recharged by connecting air lines to tractor or by using a standard air hose and filling reservoir through filler valve. When filling through filler valve, fill front (secondary) reservoir only. Attempting to use this procedure with no air source available may result in damage to equipment or serious injury to personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Failure to back off inner wheel bearing nut could cause bearing and axle spindle overheating or damage, which could result in the wheel locking up or coming off during vehicle operation. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- The axle must be firmly supported to prevent shifting of the semitrailer. Shift may cause serious injury to personnel and damage to equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Position suitable support under filter/separator to support weight. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

GENERAL SAFETY WARNINGS DESCRIPTION - Continued

WARNING

- Door and frame assembly is 200 lbs (91 kg). To prevent injury to personnel, two persons are required when removing door and frame assembly from vehicle. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. DO NOT slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Alternator weighs approximately 25 lbs (11.3 kg) Use care when replacing alternator to avoid injury to personnel or damage to equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Meter assembly is 125 lbs (57 kg). To prevent injury to personnel, two persons are required when removing meter assembly. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Brake drums weigh 85 lbs (39 kg) and require two people to lift. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

GENERAL SAFETY WARNINGS DESCRIPTION - Continued

WARNING

- Use care when removing springs. Springs are under tension and can act as projectiles when released and cause severe eye injury. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use care when installing springs. Springs are under tension and can act as projectiles when released and cause severe eye injury. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use care when removing recessed plug in rear bearing plate. Tension on bypass spring may cause it to fly out. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Particles blown by compressed air can be dangerous. Be certain to direct air stream away from the user and other personnel in the area. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Be careful when removing the impeller from the pump. The spring load on the mechanical seal may cause the impeller to fly off the shaft as it is being removed. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Wear eye protection to prevent eye injury when working with components that could fly through the air. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING

Hearing protection required within 40 ft (12.2 m) of tanker during the operation of the engine. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

GENERAL SAFETY WARNINGS DESCRIPTION - Continued

WARNING

If used incorrectly, this equipment can cause severe injury or death. Those who use and maintain the equipment should be trained in its proper use, should be warned of its dangers, and should read this entire manual before attempting to set up, operate, adjust, or service the equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

A Department of the Army waiver, #96-3, authorizes the 5000-gallon semitrailers to carry 5000 gallons of fuel (NOT WATER) when towed with the M818, M931, M931A1, M931A2, M932, M932A1 M932A2, and M1088 truck tractors; operating on hard surfaces and gravel or dirt roads. Cross-country terrain payload is limited to 3000 gallons of fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

To prevent injury to personnel or damage to equipment, speeds are limited to:

Highway and secondary roads.....40 mph (65 km/h)

Cross-country roads.....35 mph (56 km/h)

Sand/Snow .....25 mph (40 km/h)

Icy roads .....12 mph (19 km/h)

Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Rear tire pressure for the M818, M931, M931A1, M931A2, M932, M932A1 M932A2, and M1088 truck tractors must be increased to 70 psi (482.63 kPa). Truck tractors equipped with a Central Tire Inflation System (CTIS) must have the CTIS disabled (refer to vehicle Technical Manual). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Copies of the waiver can be obtained from TACOM Logistics Assistance Representative (LAR). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

GENERAL SAFETY WARNINGS DESCRIPTION - Continued

WARNING

- Equipment, safety devices, and working areas must be inspected frequently to ensure personal and operational safety and to correct potential or actual hazards. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Due to the dangers of static electricity while refueling, bonding of the semitrailer to aircraft and grounding procedures are mandatory regardless of the amount of fuel to be dispensed. Bond the fuel nozzle ground wire to the aircraft before bringing nozzle in contact with aircraft. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- All personnel must stand clear during lifting procedures. A swinging or shifting load may cause injury to personnel or damage to equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- If semitrailer is not coupled to prime mover, ensure that landing leg is lowered, locked, and wheels are chocked. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- All persons not involved in coupling operation must stand clear of prime mover and semitrailer to prevent possible injury. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- To avoid personal injury, always relieve pressure in tank shell before opening manhole cover. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Ladder has narrow tread. Use care when climbing. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Failure to torque outer wheel bearing nut properly could cause wheel to come off during vehicle operation. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Never remove any accessory items (e.g., manhole cover, cleanout caps) during pressure test. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury
- Make sure tank is empty before adjusting flow control valve. Failure to do so may result in damage to equipment or cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- If exchanging bias tires for radial tires, all tires must be changed. DO NOT mix radial and bias tires on tanker. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

GENERAL SAFETY WARNINGS DESCRIPTION - Continued

WARNING

- Use extreme caution when walking or working on top of semitrailer. Walkway can become slippery due to moisture or fuel spillage. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Do not overpressure tank. If tank is over pressurized, close control shut-off valve and open draincock valve to reduce overpressure. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING

- Use extreme caution when operating electric rewind on the hose reels. NEVER use the electric rewind on both hose reels at the same time. Electric rewind should be halted, then resumed carefully as the fuel-dispensing nozzle approaches the vehicle. As the hose becomes fully wound on the hose reel, the nozzle may slam against the vehicle with force sufficient to cause injury to personnel and/or damage to equipment. Extreme care is to be used, ensuring that the hose is rewound slowly. Caution should be used at the hose reels to prevent accidental tripping of the rewind switches. If these are accidentally depressed by hand or by falling objects, serious injury to personnel and/or damage to equipment may occur. Whenever bulk fuel hose is required, remove the necessary lengths from hose troughs and couple together as required. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

GENERAL SAFETY WARNINGS DESCRIPTION - Continued

WARNING

- To avoid injury to personnel, wait until engine assembly is cool before attempting to perform this procedure. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- With preheater switch in PREHEAT position, 12 V dc are applied to glow plugs. Do not handle glow plugs with preheater switch in PREHEAT position. Failure to comply may result in damage to, or destruction of, equipment or mission.

WARNING

- When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- When troubleshooting an electrical malfunction, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries when physically touching electrical wires and connections. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING

Tire weighs 190 lbs (86.18 kg). Four-person lift or suitable lifting device is required. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

GENERAL SAFETY WARNINGS DESCRIPTION - Continued

WARNING

- Weight of semitrailer, 13,745 lb (6,234.6 kg) to 16,350 lb (7,416.24 kg), must be supported on jack stands at all times. Actual weight for the semitrailer model can be found in (WP 0002). Do not support weight of semitrailer on lifting device. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Lifting device must have a weight capacity greater than 16,350 lb (7,416.24 kg), the weight of the semitrailer and cargo. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Landing leg weighs 110 lb (50 kg). Two people are required to lift landing leg. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING

- Manhole fill cover does not lock open. Injury may occur if manhole fill cover accidentally closes on personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Ensure that lifting device is properly positioned under cabinet. The entire weight of the cabinet is now on the lifting device. Failure to follow this warning may result in cabinet falling. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- To avoid damage to equipment and injury to personnel, place support under storage box before removing mounting screws. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Piping frame assembly is heavy and can cause injury to personnel if it should fall. An assistant is required to remove and install piping frame assembly on semitrailer. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

GENERAL SAFETY WARNINGS DESCRIPTION - Continued

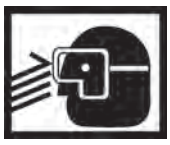
WARNING

Remove or disconnect batteries prior to performing maintenance in immediate battery area or working on electrical system. Such disconnections prevent electrical shock to personnel or equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

EXPLANATION OF HAZARDOUS MATERIALS ICONS

CHEMICAL - drops of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.

EXPLOSION - rapidly expanding symbol shows that the material may explode if subjected to high temperatures, sources of ignition, or high pressure.



EYE PROTECTION - person with protective eyewear shows that the material will injure the eyes.

FIRE - flame shows that a material may ignite and cause burns.

POISON - skull and crossbones shows that a material is poisonous or is a danger to life.

WARNING SUMMARY - Continued

EXPLANATION OF HAZARDOUS MATERIALS ICONS - Continued

VAPOR - human figure in a cloud shows that material vapors present a danger to life or limb.

HAZARDOUS MATERIALS DESCRIPTION

WARNING

- Follow all fuel handling procedures precisely. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Fuel will expand and become more flammable in extreme heat conditions. Failure to comply may result in death or injury to personnel.
- Make sure that grounding connections are made properly and firmly before any fueling operations begin so that grounding connections will not release. This will eliminate the possibility of static electricity creating sparks, which will ignite the fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- It is important that all fuel handling and operating procedures be followed precisely. A detailed study of FM 10-67-1 is essential for all fuel handling operations. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- All fueling/defueling operations must be performed outside. Failure to follow this warning may cause spark to ignite fuel vapors. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- In an emergency, close valve A or pull emergency valve shut-off on opposite side of semitrailer to manually stop the fuel flow. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- DO NOT use acetylene torch to fuse cable ends unless tank has been cleaned and purged. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Before performing the pressure or vacuum test, the semitrailer must be grounded to an approved ground (earth) and must be safe to proceed. Failure to follow this warning may cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

HAZARDOUS MATERIALS DESCRIPTION - Continued

WARNING

- When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- When troubleshooting an electrical malfunction, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries when physically touching electrical wires and connections. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- DO NOT remove nipple from motor. Nipple is packed in place with plaster. If nipple is removed, motor will no longer be explosion proof. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Make sure regulator is set to its lowest setting (turned fully counterclockwise) to avoid overpressure in tank. The pneumatic test pressure in the tank must be reached gradually. If tank is over pressurized, close control shut-off valve and open draincock valve to reduce overpressure. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING

- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- If Nuclear, Biological, and Chemical (NBC) exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your NBC Officer for appropriate handling or disposal instructions. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

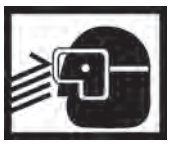
WARNING SUMMARY - Continued

HAZARDOUS MATERIALS DESCRIPTION - Continued

WARNING

Carbon monoxide can be deadly. DO NOT operate engine in an enclosed area unless it is adequately ventilated. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING



Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

HAZARDOUS MATERIALS DESCRIPTION - Continued

WARNING

Do not attempt to jump-start engine. Jump-starting may result in damage to batteries or serious fire hazard. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING

- The operator must be alert for leaking and malfunctioning equipment. Stop all servicing operations immediately at the first sign of leaks or malfunctions. Corrective action must be performed by qualified technicians before resuming any operations. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Temperature changes may cause leaks at fittings and connectors. Inspect all fittings and connectors, and report all leaks to Maintenance Supervisor before operating trailer. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- All fuel connections must be plugged or capped to prevent contamination and equipment damage. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

HAZARDOUS MATERIALS DESCRIPTION - Continued

WARNING

- DO NOT mix incompatible fuels and/or liquids in tank. Dangerous fumes and explosion may result. Know what fuel was previously carried so that preventive measures may be taken to ensure that injurious or explosive fumes are not released. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- DO NOT climb into interior of tank until it has been completely drained and purged and a combustible gas indicator indicates that it is safe. Adequate forced air ventilation or a self-contained breathing apparatus must be used. Any person entering tank must have an attached lifeline. An observer must be stationed at the manhole opening so that assistance may be summoned in the event of an emergency. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING

- Before performing the pressure test, the semitrailer must be grounded to an approved ground (earth) and it must be safe to proceed. Failure to follow this warning may cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Make sure tank and piping system are free of all liquid and that tank is purged of all vapor (implement the cleaning procedures, as applicable, refer to TB ORD 1031). Failure to follow this warning may cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

HAZARDOUS MATERIALS DESCRIPTION - Continued

WARNING

Make sure grounding studs are installed on clean, unpainted metal surface. If mounting surface is painted, scrape off paint to bare metal. Failure to comply my result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING

- Batteries produce explosive gases. Keep sparks, flame, and smoking material away. Ventilate when charging or using in an enclosed space. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Batteries contain sulfuric acid that causes severe burns. If acid contacts eyes, skin, or clothing, flush well with water. For contact with eyes, get immediate medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Battery acid (electrolyte) is extremely harmful. Always wear protective eyewear and rubber gloves and do not smoke when performing maintenance on batteries. Injury will result if acid contacts skin or eyes. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

HAZARDOUS MATERIALS DESCRIPTION - Continued

WARNING

- Read and observe all safety precautions listed in the warning summary before performing maintenance on filler/separator. Ensure that semitrailer is grounded to an approved ground (earth) and it is safe to proceed. Failure to follow this warning may cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- When filling tank by means of bottom loading, defueling (M970A1) or self-loading, a test of the pre-check system is mandatory. If this system is not functioning, stop all operations. Determine the problem and have it corrected by a qualified technician. Failure of automatic shut-off to function may cause uncontrolled fuel spillage, fire, and/or explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- When top loading through fill cover, there is no automatic shutdown. Man the loading hose to avoid fuel spillage. Use the capacity indicator gage and dipstick gage to determine amount of fuel loaded. Failure to follow this warning may cause uncontrolled fuel spillage, fire and/or explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- When filling tank by means of self-loading, a test of the pre-check system is mandatory. If this system is not functioning, stop all operations. Determine the problem and have it corrected by a qualified technician or Field Maintenance. Failure of automatic shut-off to function may result in uncontrolled fuel spillage and danger of fire and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY - Continued

HAZARDOUS MATERIALS DESCRIPTION - Continued

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for fifteen minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for inhalation move to fresh air if not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cleaning solvent MIL-PRF-680 is toxic and flammable. Always wear protective eyewear and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat. The solvent's flash point is 100°F-138°F (38°C-59°C). If you become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts eyes, immediately wash your eyes and get medical aid. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible; DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in a confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. The flashpoint for Type II solvent cleaning compound is 141-198°F (61-92°C) and Type III is 200-240°F (93-116°C). Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

LIST OF EFFECTIVE PAGES/WORK PACKAGES

NOTE: This manual supersedes TM 9-2330-356-14 dated 26 October 1990, TM 9-2330-398-10 and TM 9-2330-398-24 dated 15 June 1996, including all changes.

Note: Zero in the “Change No.” column indicates an original page or work package.

Date of issue for the revised manual is:

Original 31 December 2015

TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 88 AND TOTAL NUMBER OF WORK PACKAGES IS 296 CONSISTING OF THE FOLLOWING:

Page/WP No.	Change No.	Page/WP No.	Change No.
Front Cover/blank	0		
a-s/blank	0	WP 0035 (2 pages)	0
i/blank	0	WP 0036 (2 pages)	0
iii-xxxix/blank	0	Chapter 4 Title Page	0
xli-xlii	0	WP 0037 (2 pages)	0
Chapter 1 Title Page	0	WP 0038 (2 pages)	0
WP 0001 (6 pages)	0	WP 0039 (4 pages)	0
WP 0002 (28 pages)	0	WP 0040 (4 pages)	0
WP 0003 (4 pages)	0	WP 0041 (4 pages)	0
Chapter 2 Title Page	0	WP 0042 (2 pages)	0
WP 0004 (14 pages)	0	WP 0043 (2 pages)	0
WP 0005 (2 pages)	0	WP 0044 (4 pages)	0
WP 0006 (2 pages)	0	WP 0045 (2 pages)	0
WP 0007 (8 pages)	0	WP 0046 (2 pages)	0
WP 0008 (4 pages)	0	WP 0047 (2 pages)	0
WP 0009 (6 pages)	0	WP 0048 (2 pages)	0
WP 0010 (6 pages)	0	WP 0049 (4 pages)	0
WP 0011 (8 pages)	0	WP 0050 (4 pages)	0
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HEADQUARTERS, DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 31 DECEMBER 2015

TECHNICAL MANUAL

FOR
OPERATOR AND FIELD MAINTENANCE MANUAL

SEMITRAILER, TANK, 5000 GALLON, BULK HAUL, SELF LOAD/UNLOAD
M967A1
NSN 2330-01-155-0046 (EIC CVW)
M967A1P1
NSN 2330-01-531-4059 (EIC C5M)

SEMITRAILER, TANK, 5000 GALLON, FUEL DISPENSING, AUTOMOTIVE
M969A1
NSN 2330-01-155-0048 (EIC CVY)
M969A1P1
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M969A2
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M969A2P1
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SEMITRAILER, TANK, 5000 GALLON, FUEL DISPENSING UNDER/OVERWING AIRCRAFT
M970A1
NSN 2330-01-155-0047 (EIC CVX)

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Index

HOW TO USE THIS MANUAL

SCOPE

This technical manual contains operating instructions, component locations, and specifications for the safe and efficient operation of the Self Load/Unload, Bulk Haul, 5,000 Gallon Tank Semitrailer, Models M967A1 and M967A1P1; the Automotive Fuel Dispensing, 5,000 Gallon Tank Semitrailer, Models M969A1, M969A1P1, M969A2, and M969A2P1; and the Under/Overwing Aircraft Fuel Dispensing, 5,000 Gallon Tank Semitrailer, Model M970A1. It also contains operational and field level troubleshooting and maintenance procedures for these vehicles.

WARNINGS, CAUTIONS, AND NOTES

WARNINGS, CAUTIONS, and NOTES occur throughout this manual. An explanation for each follows:

A **WARNING** precedes the text of any procedure that poses a clear danger to the person performing it. Warnings contain critical data for ensuring personal safety.

A **CAUTION** precedes the text of any procedure involving a clear risk of damage to equipment.

A **NOTE** is used to highlight essential conditions or statements that clarify instructions and make procedures easier to accomplish.

CHAPTER 1: GENERAL INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

This chapter describes the semitrailer and its major assemblies and components. It contains a specification table for the semitrailer equipment as well as information needed for maintaining records and making equipment recommendations.

CHAPTER 2: OPERATOR INSTRUCTIONS

This chapter describes, locates, and illustrates the controls and indicators used on the semitrailer. It contains detailed instructions for bulk hauling and all fuel servicing operations, as well as instructions for operation of the vehicle under unusual conditions.

CHAPTER 3: TROUBLESHOOTING PROCEDURES

Use the troubleshooting index to find the common operator and field malfunctions and symptoms that may occur during use of the semitrailer. Perform the troubleshooting and corrective actions in the order listed within each individual work package.

CHAPTER 4: PREVENTIVE MAINTENANCE CHECKS AND SERVICES

This chapter contains operator and field level Preventive Maintenance Checks and Services (PMCS). Semitrailer components must be inspected periodically to find and correct defects, and regular services are needed to keep the semitrailer operational.

CHAPTER 5: OPERATOR MAINTENANCE INSTRUCTIONS

This chapter provides operator-level maintenance procedures. Remove/disassemble only to the extent necessary to replace defective components/assemblies. Use standard maintenance practices/procedures.

HOW TO USE THIS MANUAL - Continued

CHAPTER 6: FIELD MAINTENANCE INSTRUCTIONS

This chapter provides field-level maintenance and servicing instructions for the semitrailer. It includes instructions for the repair and/or replacement of many semitrailer components and assemblies. Use standard maintenance practices/procedures.

CHAPTER 7: SUPPORTING INFORMATION

This chapter includes References, the Maintenance Allocation Chart (MAC), Components of End Items (COEI) and Basic Issue Items (BII) Lists, the Expendable and Durable Items List (EDIL), the Tool Identification List (TIL), and a list of Mandatory Replacement Parts (MRP).

ALPHABETICAL INDEX

An alphabetical index of work packages is located after the last work package in this manual.

CHAPTER 1

GENERAL INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

OPERATOR MAINTENANCE
GENERAL INFORMATION

SCOPE

This manual contains operation and maintenance instructions for the following 5000 Gallon Tank Semitrailers:

- Semitrailer, Tank, 5000 Gallon, Bulk Haul, Self Load/Unload, M967A1
- Semitrailer, Tank, 5000 Gallon, Fuel Dispensing, Automotive, M969A1
- Semitrailer, Tank, 5000 Gallon, Fuel Dispensing, Automotive, M969A2
- Semitrailer, Tank, 5000 Gallon, Fuel Dispensing, Under/Overwing Aircraft, M970A1

The operation and maintenance instructions for the P series tankers are the same as their non-P series models.

Throughout the manual, the terms, "right" or "curbside" and "left" or "roadside" are used to describe views of the semitrailers as viewed from the rear.

The operation and maintenance of any fuel-hauling semitrailer can be hazardous due to the flammable and explosive nature of the load.

Read and become familiar with all WARNINGs in the warning summary at the front of this manual.

Throughout this manual, WARNINGs are placed as they pertain to specific operational or maintenance procedures. Read these WARNINGs and follow them exactly.

The following is a summary of safety regulations that MUST be strictly observed when operating or maintaining the semitrailers. Personnel who fail to follow these regulations endanger the mission, equipment, and lives of themselves and bystanders.

To become familiar with safe fuel handling procedures refer to FM 10-67-1.

Personnel engaged in the operation and maintenance of the semitrailer must not wear clothing that generates static electricity. DO NOT wear nylon, silk, rayon, or other similar materials. Remove all contents from pockets. Wear rubber boots and gloves during fuel loading and unloading.

Before loading fuel, unloading fuel, or purging tank on semitrailer, connect all bonding and grounding connections.

Never climb on semitrailer without first touching grounding stud to discharge static electricity from your body.

Under normal circumstances, perform all maintenance on semitrailer outdoors, away from buildings, and with tank empty. The semitrailer tank should be checked to make sure it is free of vapors that could ignite during maintenance activities.

If circumstances require that maintenance be performed inside a building, the semitrailer tank must be thoroughly drained and purged and the exterior of semitrailer steam cleaned. After purging, the combustible gas indicator must read in the SAFE zone. The semitrailer MUST be retested prior to starting work each day and at regular intervals throughout the day. This test can be accomplished by authorized personnel with an MOS of 92F or the equivalent training qualifications.

For purging and cleaning interior and exterior of semitrailer refer to TB ORD 1031.

Hearing protection is required for personnel within 50 ft (15.2 m) of the semitrailer when the pump engine is running.

To reduce the risk of fire and explosion, DO NOT perform the following operations on the semitrailer unless the tank has been drained and purged and the exterior has been steam cleaned:

- Replace any component that communicated with the inside of the tank and therefore came in contact with fuel or vapors: these components include manhole, jet level sensor and tubing, emergency valve vapor collection system components, vent caps, sump drain, piping assembly, front port, or rear inlet.

SCOPE - Continued

- Troubleshoot the electrical system with any test device other than the ohms scale of a multimeter.
- Weld or solder.
- Cut with acetylene torch or chisel and hammer.
- Drill (except aluminum).

Follow these rules if working inside a purged tank:

- Always provide adequate forced air ventilation with air directed inside to the compartment where work is being performed.
- NEVER work alone inside a tank; a second person must be stationed at the manhole opening. A third person must be close by to provide aid and/or assistance in case of an emergency. The person inside the tank must have on a safety line and harness for rescue operations in case of emergency.
- If the person inside the tank encounters any difficulties, the person stationed at the manhole must summon assistance IMMEDIATELY. DO NOT attempt a rescue until assistance has arrived.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 750-8, Functional Users Manual for The Army Maintenance Management System (TAMMS) or AR 700-138, Army Logistics Readiness and Sustainability.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your M900 series semitrailers needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design or performance.

ALL non-Aviation/Missile EIRs and PQDRs must be submitted through the Product Data Reporting and Evaluation Program (PDREP) Web site. The PDREP site is: https://www.pdrep.csd.disa.mil/.

If you do not have Internet access, you may submit your information using an SF 368 (Product Quality Deficiency Report). You can send your SF 368 using email, regular mail, or fax using the addresses/fax numbers specified in DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual. We will send you a reply.

CORROSION PREVENTION AND CONTROL (CPC) FOR TACTICAL VEHICLES

Corrosion prevention and control of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items. The term "corrosion" means the deterioration of a material or its properties due to a reaction of that material with its chemical environment. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue, and/or cracking. Plastics, composites, and rubbers can also degrade (also considered to be corrosion based on the above definition of corrosion). Degradation is caused by thermal (heat), oxidation (oxygen), solvation (solvents), or photolytic (light, typically ultraviolet) processes. The most common exposures are excessive heat or light. Damage from these processes will appear as cracking, softening, swelling, and/or breaking. The U.S. Army has defined the following nine (9) forms of corrosion used to evaluate the deterioration of metals. These shall be used when evaluating and documenting corrosion.

UNIFORM (or general attack): Affects a large area of exposed metal surface, like rust on steel or tarnish on silver. It gradually reduces the thickness of the metal until it fails.

CREVICE: Occurs in crevices created by rubber seals, gaskets, bolt heads, lap joints, dirt or other surface deposits. It will develop anywhere moisture or other corrosive agents are trapped and unable to drain or evaporate.

CORROSION PREVENTION AND CONTROL (CPC) FOR TACTICAL VEHICLES - Continued

SELECTIVE LEACHING: One element, usually the anodic element of an alloy, corrodes away, leaving the cathodic element. This can create holes in metal.

INTERGRANULAR: Metal deterioration caused by corrosion on the bonds between or across the grain boundaries of the metal. The metal will appear to be peeling off in sheets, flaking, or being pushed apart by layers. A particular type of intergranular corrosion is exfoliation.

PITTING: This can result from conditions similar to those for crevice corrosion. Pits can develop on various materials due to their composition. Rifle boxes are big victims of pitting.

EROSION: Results when a moving fluid (liquid or gas) flows across a metal surface, particularly when solid particles are present in the fluid. Corrosion actually occurs on the surface of the metal, but the moving fluid washes away the corrosion and exposes a new metal surface, which also corrodes.

FRETTING: Occurs as a result of small, repetitive movements (e.g., vibration) between two surfaces in contact with each other. It is usually identified by a black powder corrosion product or pits on the surface.

GALVANIC: Occurs when two different types of metal come in contact with each other, like steel bolts on aluminum, for example. This is a common problem on aircraft because of their mix of metals.

STRESS: Term used to describe corrosion cracking and corrosion fatigue.

Where an item is not ready/available due to one of these forms of corrosion, it shall be recorded as a corrosion failure in the inspection record and the appropriate code (170) for corrosion shall be used when requesting/ performing maintenance.

Refer to TB 43-0213 for further information about corrosion.

SF 368, Product Quality Deficiency Report (PQDR) should be submitted to the address specified in DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Procedures for destruction of Army Materiel to prevent enemy use can be found in TM 750-244-3.

PREPARATION FOR STORAGE OR SHIPMENT

For procedures on preparation for storage or shipment, refer to (WP 0090).

WARRANTY INFORMATION

The semitrailers covered in this manual are not warranted.

OFFICIAL NOMENCLATURE, NAMES AND DESIGNATIONS

Nomenclature in this manual was chosen in accordance with the terms used for provisioning as they appear in the Repair Parts and Special Tools List (RPSTL) and Maintenance Allocation Chart (MAC) for Field Maintenance on the M900 series semitrailers.
A few components are, however, referred to by names more common than those in the RPSTL. In many cases, the more common name is a shorter name for the same component.

Table 1. Nomenclature Cross-Reference.

Manual Nomenclature	Official Nomenclature
lockwire	nonelectrical wire
wiring harness	branched wiring harness

LIST OF ABBREVIATIONS AND ACRONYMS

A	Annually
AAL	Additional Authorization List
BII	Basic Issue Items
C	Centigrade
CAGEC	Commercial and Government Entity Code
CARC	Chemical Agent Resistant Coating
Class	Classification
cm	Centimeter
COEI	Components of End Item
CPC	Corrosion Prevention and Control
CTIS	Central Tire Inflation System
cu	Cubic
cu cm	Cubic Centimeter
cu in.	Cubic Inch
DA	Department of the Army
DOD	Department of Defense
ECU	Engine Control Unit
EDIL	Expendable Durable Items List
EIR	Equipment Improvement Recommendation
F	Fahrenheit
ft	Foot
GAA	Grease, Automotive, and Artillery
gpm	Gallons per Minute
H	Hour
IAW	In Accordance With
IGS	International Grounding Symbol
in.	Inch

LIST OF ABBREVIATIONS AND ACRONYMS - Continued

kg	Kilogram
km/h	Kilometers per Hour
kPa	Kilopascal
L	Liter; Low
lb/lbs	Pound(s)
lb ft	Foot-Pound
lb in.	Inch-Pound
LED	Light Emitting Diode
m	Meter
M	Monthly
MAC	Maintenance Allocation Chart
MOS	Military Occupational Specialty
mph	Miles per Hour
MTOE	Modification Table of Organization and Equipment
NBC	Nuclear, Biological and Chemical
N·m	Newton Meters
NSN	National Stock Number
pc	Port Closing
PMCS	Preventive Maintenance Checks and Services
POL	Petroleum Oils and Lubricants
psi	Pounds Per Square Inch
psid	Pounds Per Square Inch, Differential
qt	Quart
Qty Rqr	Quantity Required
ROM	Refuel on the Move

LIST OF ABBREVIATIONS AND ACRONYMS - Continued

ROM	Refuel on the Move
RPM	Revolutions Per Minute
S	Seminannually
SN	Serial Number
SOUM	Safety of Use Messages
TAMMS	The Army Maintenance Management System
TOE	Table of Organization and Equipment
U/M	Unit of Measure
V dc	Volts, Direct Current
W/	With
wc	Water Column
W/O	Without
WP	Work Package

QUALITY ASSURANCE

No specific quality assurance manual pertains to the semitrailers.

Defective material received through the supply system should be reported on an SF Form 368 (Product Quality Deficiency Report). Instructions for preparing the reports are provided in AR 702-7, Reporting of Product Quality Deficiencies Across Component Lines. Mail your completed form to:

Commander

U.S. Army Tank-Automotive and Armaments Command ATTN:

AMSTA-IM-QPIT

Warren, MI 48397-5000

SAFETY, CARE, AND HANDLING

For information on general safety precautions and regulations, review the warning summary at the front of this manual and the safety summary that follows the Table of Contents. Observe all WARNINGs and CAUTIONs that appear in the maintenance procedures.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
EQUIPMENT DESCRIPTION

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

The M900 semitrailers have a stainless steel, single-compartment tank of 5000-gallon capacity, plus 3 percent capacity for product expansion. The chassis is constructed of welded steel and is equipped with full floating tandem axles and manually operated landing gear.

To prevent injury to personnel or damage to equipment, speeds are limited to:

Highway and secondary roads:	40 mph (64 km/h)
Cross-country roads:	35 mph (56 km/h)
Sand/Snow:	25 mph (40 km/h)
Icy roads:	12 mph (19 km/h)

Rear tire pressure for the M931, M931A1, M932, M932A1, M932A1, M932A2, and M1088 truck tractors must be increased to 70 psi (482.65 kPa). Truck tractors equipped with Central Tire Inflation Systems (CTIS) must have the CTIS disabled (refer to vehicle Technical Manual).

Copies of the waiver can be obtained from TACOM Logistics Assistance Representative (LAR).

The semitrailers are designed to be towed by a truck equipped with a fifth wheel. Authorized 5-ton truck tractors are the M818, M931, M931A1, M931A2, M932, M932A1, M932A2, and M1088. When driving on hard surface highways only, the 10-ton military-adapted commercial 6 x 4 truck tractors (the M915, M915A1, and M915A2) are also authorized. The construction and basic configuration of the M900 series semitrailers are the same except for the following: dispensing equipment, bogie, braking system, full-tank lifting capability, spare tire carrier assembly, blackout lights, control panel secure lighting, radial tires, engine electrical system, and functional use.

All semitrailer models, can be loaded through bottom or top fill openings. The 3-cylinder Lombardini diesel engine with pump assembly provides self-load/unload capability.

The semitrailers are equipped with pressure and vacuum vents, hose troughs, sealed manhole, calibrated gage, bulk fuel hoses, portable grounding rod, static reel, and spare tire. A ladder is provided at the rear for access to the top manhole. A vapor recovery system can be installed on all models.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

Table 1. M967A1.

KEY	COMPONENT	DESCRIPTION
1	Grounding Studs	Allows semitrailer to be grounded, discharging static electricity.
2	Drain Pipes	Allows water to drain from top of semitrailer.
3	Emergency Valve Shut-off	Manually stops fuel flow in an emergency.
4	Ladder	Allows access to top manhole.
5	Fire Extinguisher	Provides portable fire extinguishing capabilities at the point of operation.
6	Step	Allows access to ladder.
7	Vapor Recovery System	Allows fuel depot to coiled/recover vapors and gases present during loading operations.
8	Hose Trough Covers	Protects hoses when stored in hose troughs.
9	Hose Troughs	Stores hoses.
10	Piping Assembly	Dispenses fuel.
11	Storage Box	Stores tools.
12	Engine Control Panel	Houses controls, meters, and gages for pump engine.
13	Landing Leg Ground Boards	Positioned under landing leg shoe when semitrailer is uncoupled in mud, sand, or snow.
14	Portable Grounding Rod	Allows semitrailer to be grounded, discharging static electricity.
15	Engine Fuel Tank	Stores fuel for pump engine.
16	Pump and Engine Compartment	Houses pump and engine.
17	Batteries	Provides electricity for starting pump engine.

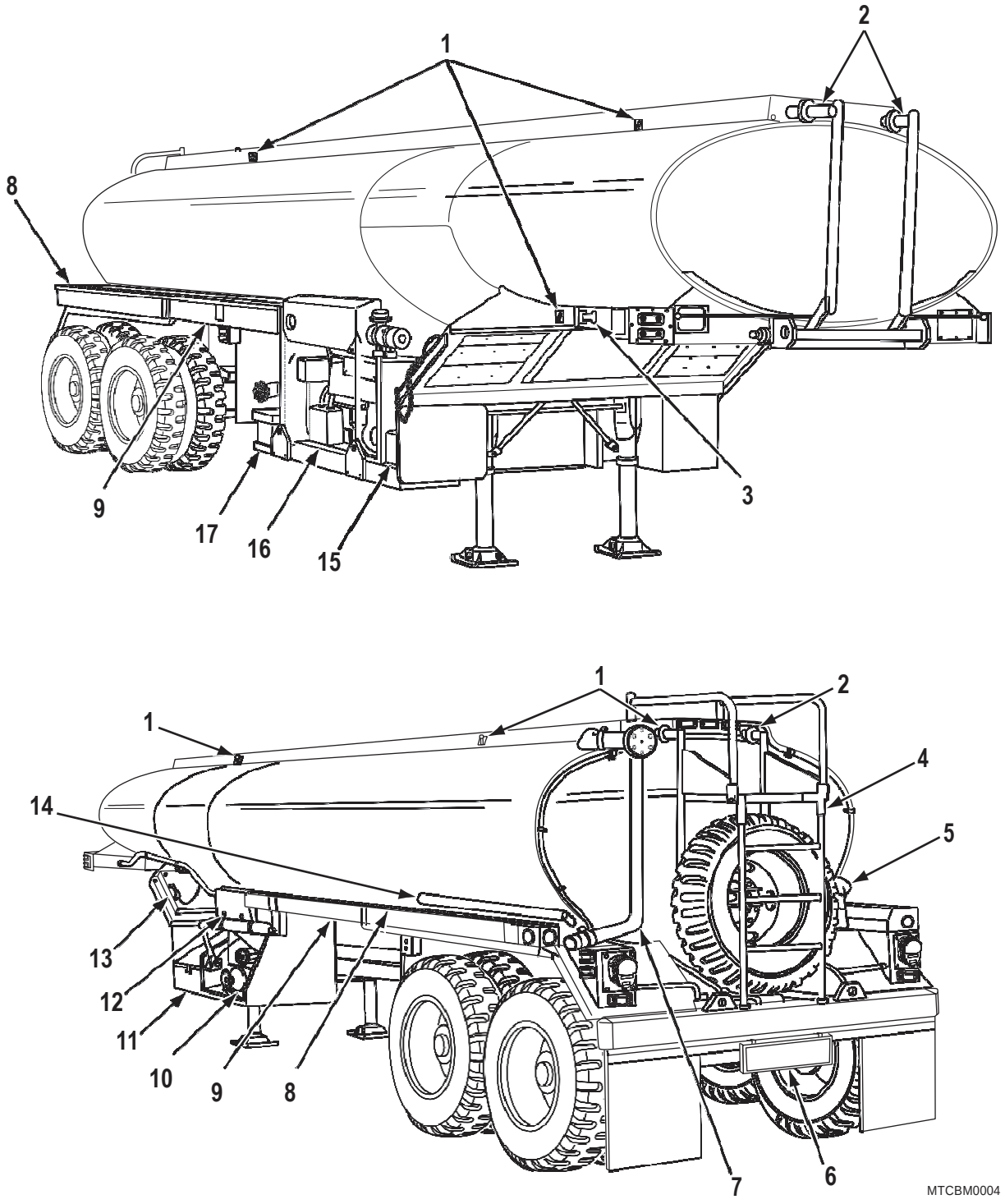


Figure 1. Front and Left Rear View M967A1.

Table 2. M969A1.

KEY	COMPONENT	DESCRIPTION
1	Grounding Studs	Allows semitrailer to be grounded.
2	Drain Pipes	Allows water to drain from top of semitrailer.
3	Emergency Valve Shut-off	Manually stops fuel flow in an emergency.
4	Ladder	Allows access to top manhole.
5	Fire Extinguisher	Provides portable fire extinguishing capabilities.
6	Step	Allows access to ladder.
7	Vapor Recovery System	Allows fuel depot to collect/recover vapors and gases.
8	Hose Troughs	Stores hoses.
9	Hose Trough Covers	Protects hoses when stored in hose troughs.
10	Hose Reel Cabinets	Houses hose reels and hoses.
11	Piping Assembly	Dispenses fuel.
12	Storage Box	Stores tools.
13	Engine Control Panel	Houses controls, meters, and gages for pump engine.
14	Landing Leg Ground Boards	Positioned under landing leg shoe when semitrailer is uncoupled in mud, sand, or snow.
15	Portable Grounding Rod	Allows semitrailer to be grounded.
16	Engine Fuel Tank	Stores fuel for pump engine.
17	Pump and Engine Compartment	Houses pump and engine.
18	Batteries	Provides electricity for starting pump engine.
19	Filter/Separator	Separates water from fuel and filters fuel.

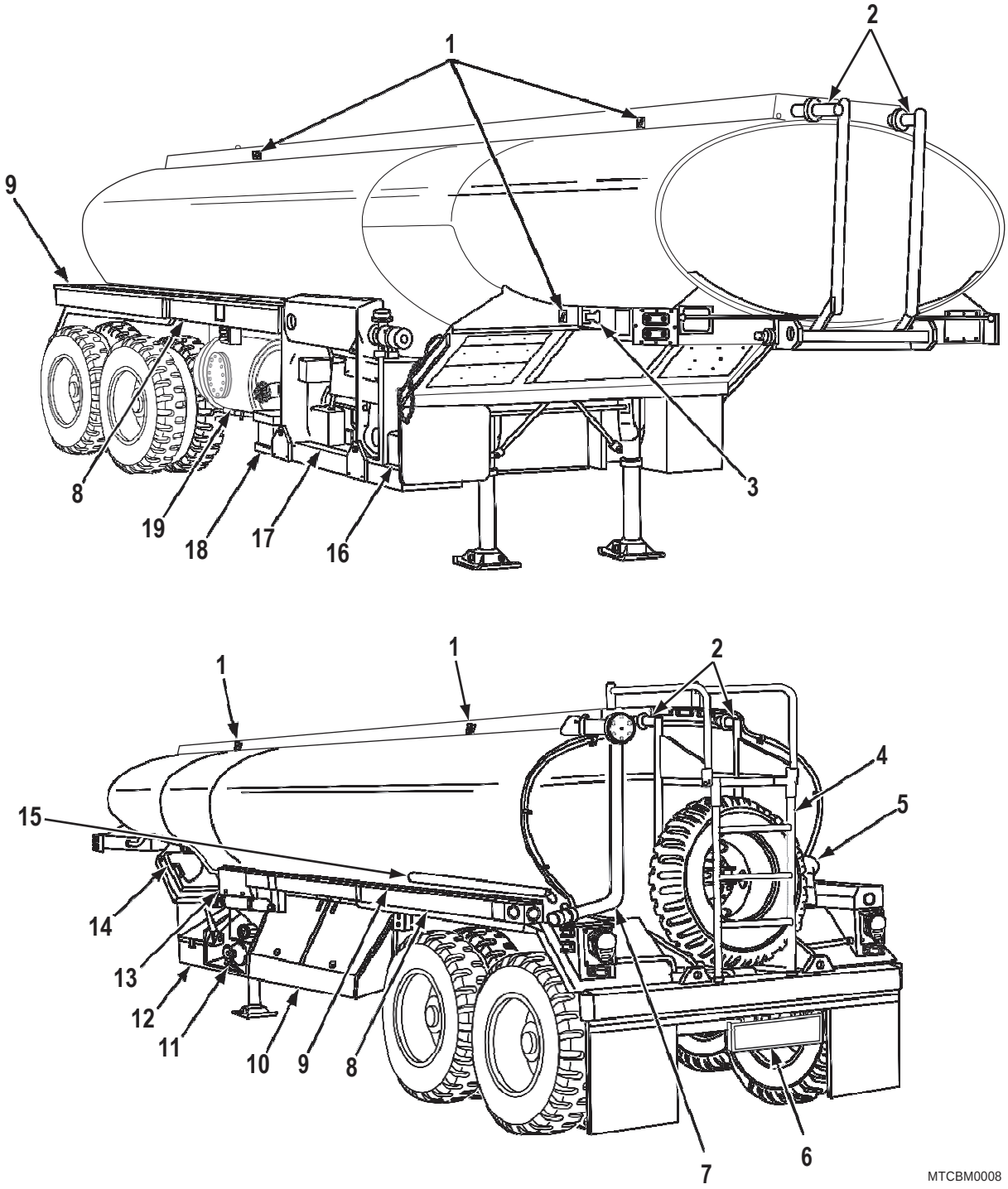


Figure 2. Front and Rear View M969A1.

Table 3. M969A2.

KEY	COMPONENT	DESCRIPTION
1	Grounding Studs	Allows semitrailer to be grounded.
2	Drain Pipes	Allows water to drain from semitrailer.
3	Emergency Valve Shut-off	Manually stops fuel flow.
4	Ladder	Allows access to top manhole.
5	Portable M13 Decontaminating Apparatus	Used to spray decontaminating agent.
6	Step	Allows access to ladder.
7	Spare Tire Carrier and Winch	Allows easy deployment and recovery of spare tire.
8	Fire Extinguishers	Provides portable fire extinguishing capabilities.
9	Portable Grounding Rod	Allows semitrailer to be grounded.
10	Vapor Recovery System	Allows fuel depot to collect/recover vapors and gases.
11	Hose Reel Cabinets	Houses hose reels and hoses.
12	Piping Assembly	Dispenses fuel.
13	Tool Box	Stores tools.
14	Engine Control Panel	Houses controls, meters, and gages.
15	Landing Leg Ground Boards	Used when semitrailer is uncoupled in mud, sand, or snow.
16	Engine Fuel Tank	Stores fuel for pump engine.
17	Pump and Engine Compartment	Houses pump and engine.
18	Batteries	Provides electricity for starting pump.
19	Filter/Separator	Separates/filters water from fuel.
20	Hose Troughs	Stores hoses.
21	Hose Trough Covers	Protects hoses when stored.

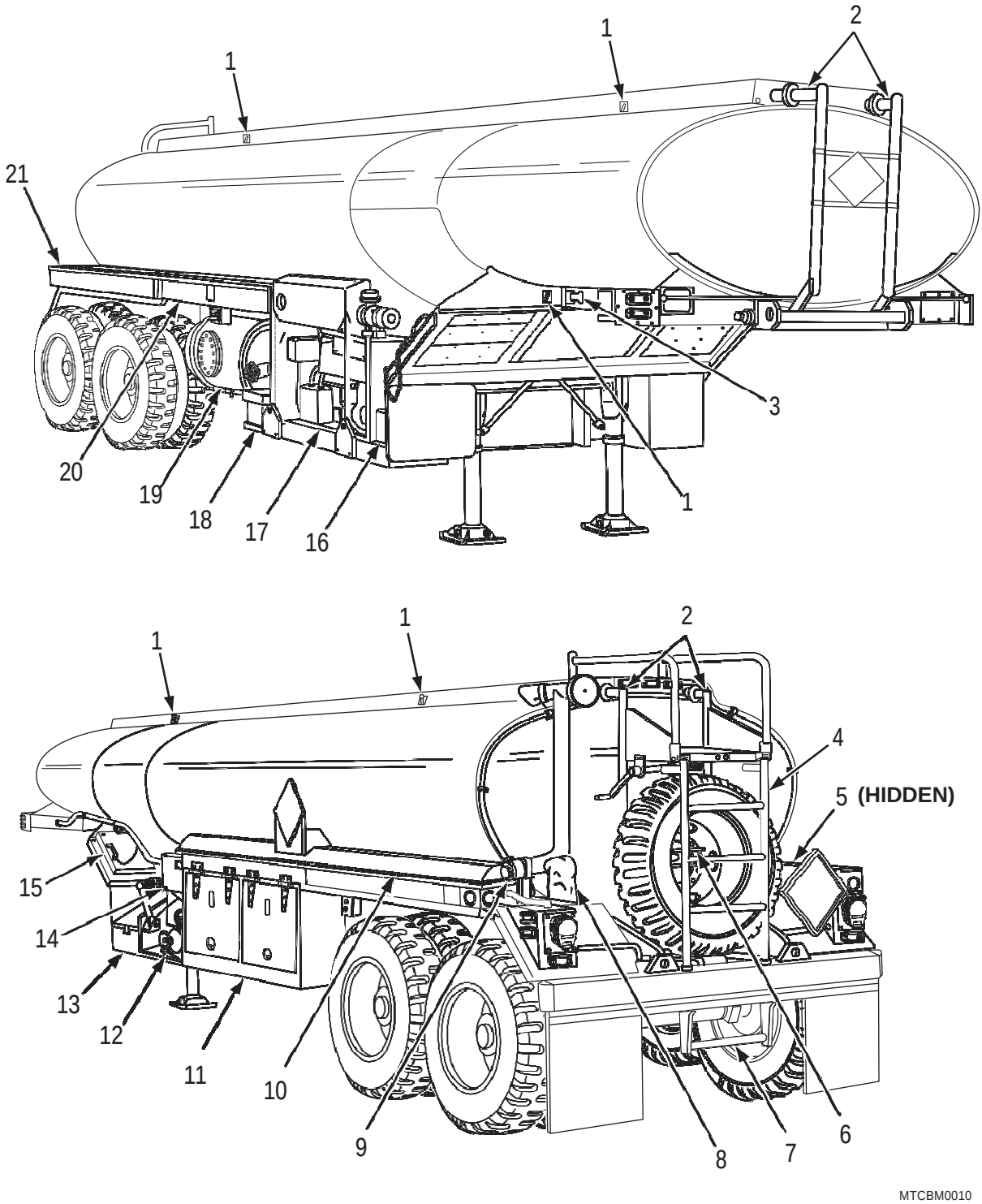


Figure 3. Front and Rear View M969A2.

Table 4. M970A1.

KEY	COMPONENT	DESCRIPTION
1	Drain Pipes	Allows water to drain from semitrailer.
2	Grounding Studs	Allows semitrailer to be grounded.
3	Recirculation Fitting	Allows fuel to be sampled and recirculated through filtering and dispensing system.
4	Portable Grounding Rod	Allows semitrailer to be grounded.
5	Hose Trough Covers	Protects hoses when stored in hose troughs.
6	Hose Troughs	Stores hoses.
7	Hose Reel Cabinets	Houses hose reels and hoses.
8	Engine Control Panel	Houses controls, meters, and gages.
9	Piping Assembly	Dispenses fuel.
10	Storage Box	Stores tools.
11	Emergency Valve Shut-off	Manually stops fuel flow.
12	Landing Gear Control	Controls operation of landing gear.
13	Engine Fuel Tank	Stores fuel for pump engine.
14	Pump and Engine Compartment	Houses pump and engine.
15	Batteries	Provides electricity for starting pump.
16	Filter/Separator	Separates water from fuel and filters fuel.
17	Step	Allows access to ladder.
18	Vapor Recovery System	Allows fuel to collect/recover vapors.
19	Fire Extinguisher	Provides portable fire extinguishing capabilities.
20	Landing Leg Ground Boards	Positioned under landing leg shoe when semitrailer is uncoupled in mud, sand, or snow.

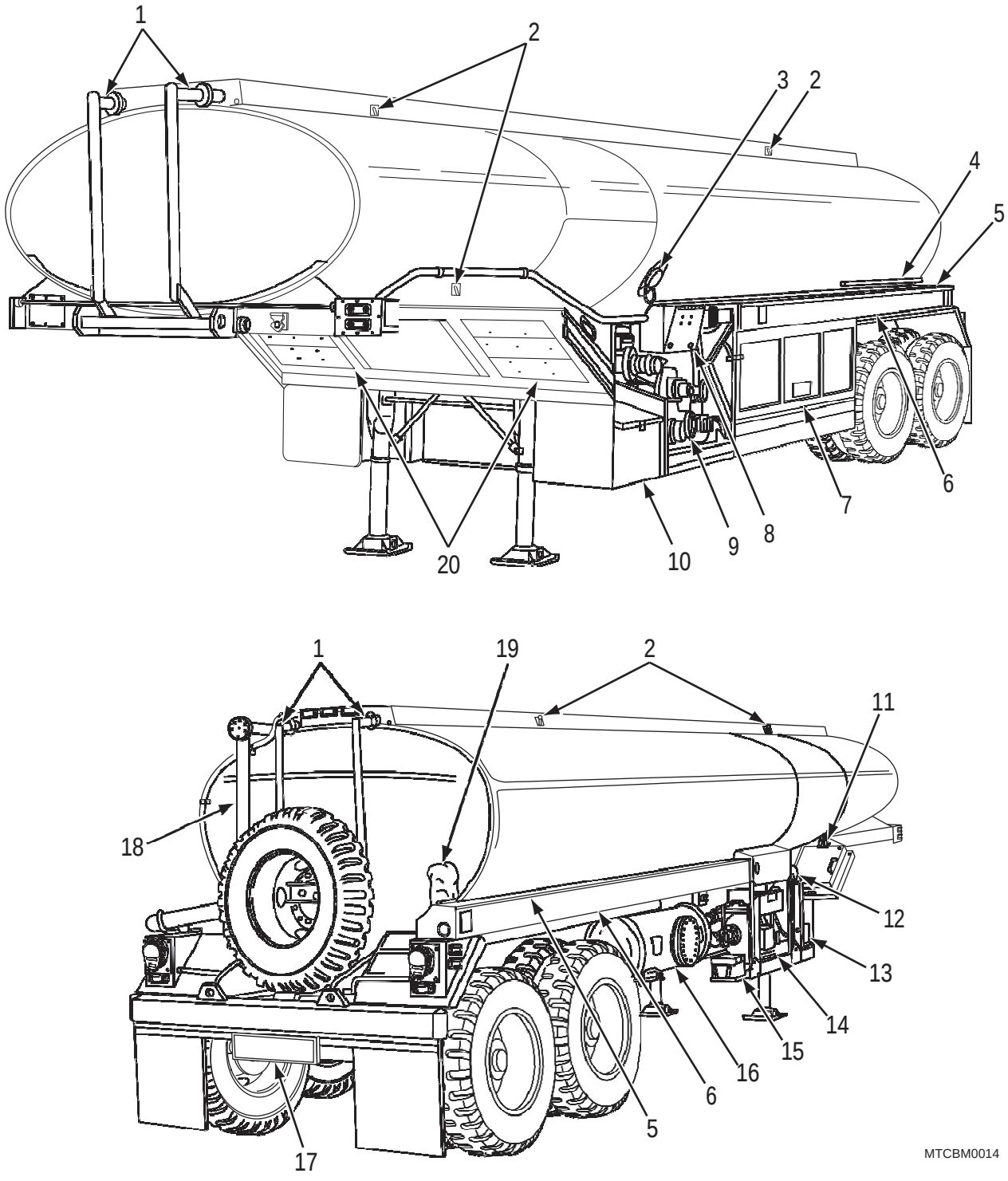


Figure 4. Front and Rear View M970A1.

1. The following illustrations show the location and contents of all decals and data plates.
2. Maintain all decals and data plates so that all information remains legible. If any decal or data plate is missing or no longer legible, notify Field Maintenance.

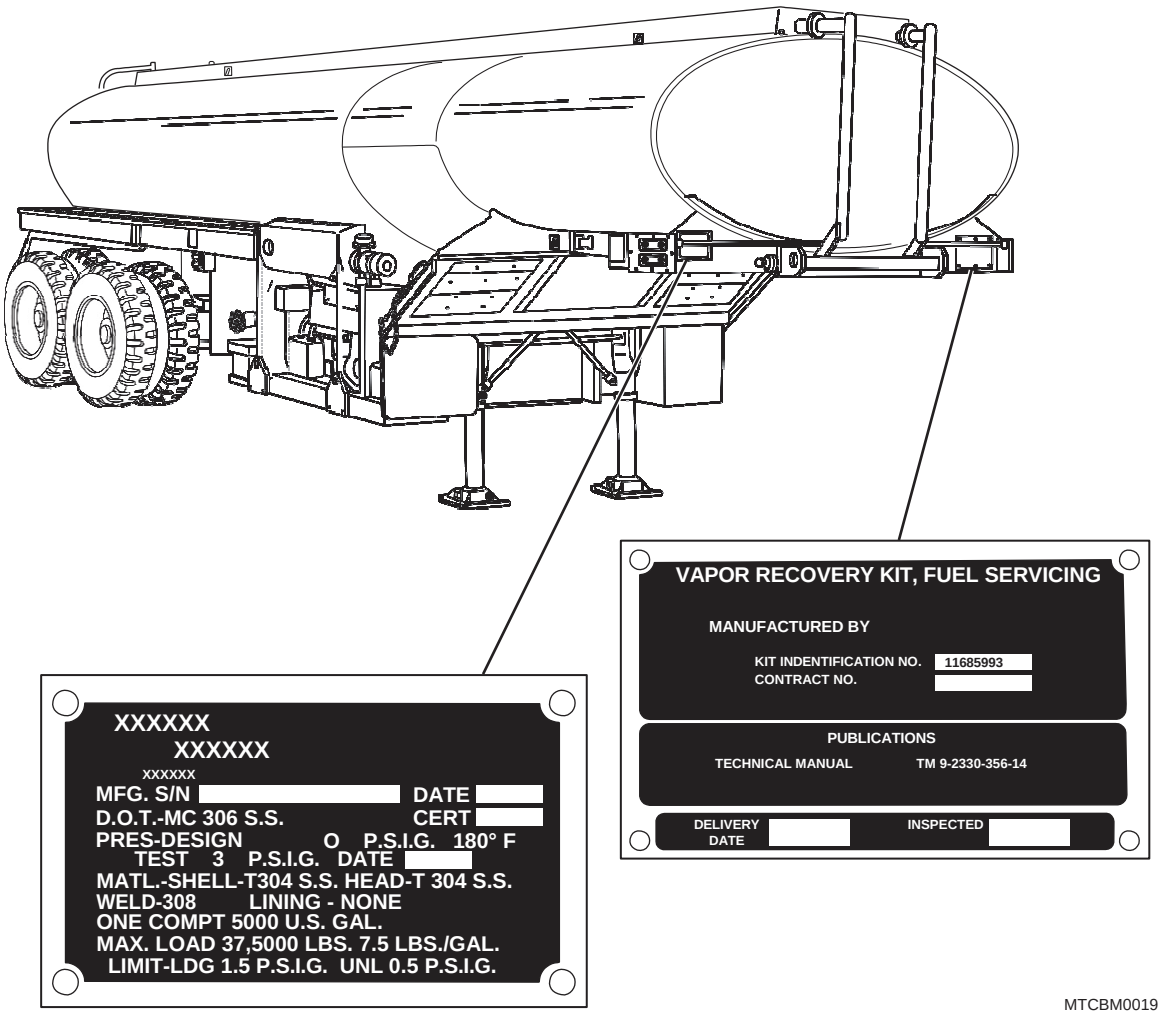


Figure 5. Front View Data Plates M967A1.

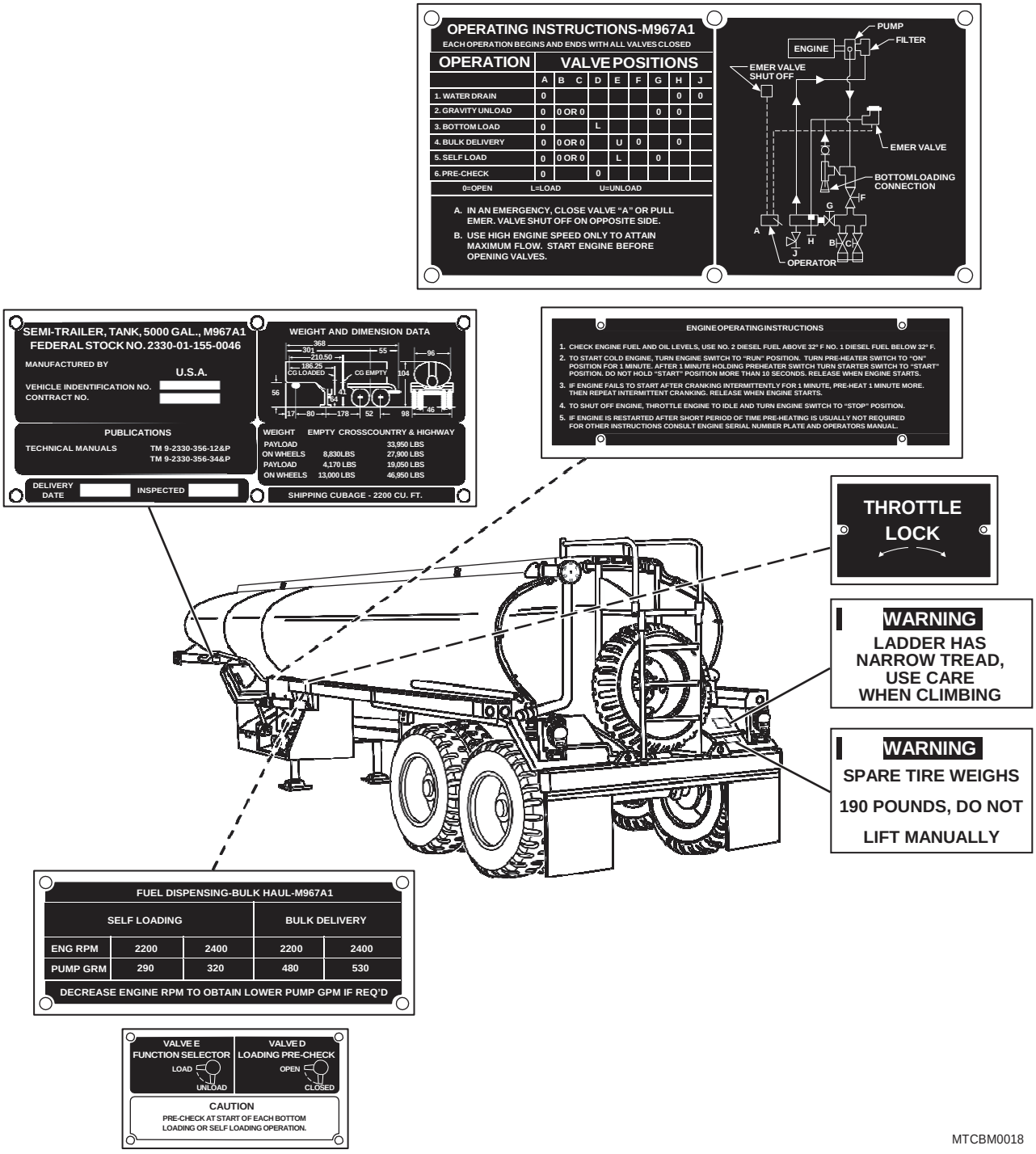


Figure 6. Rear View Data Plates M967A1.

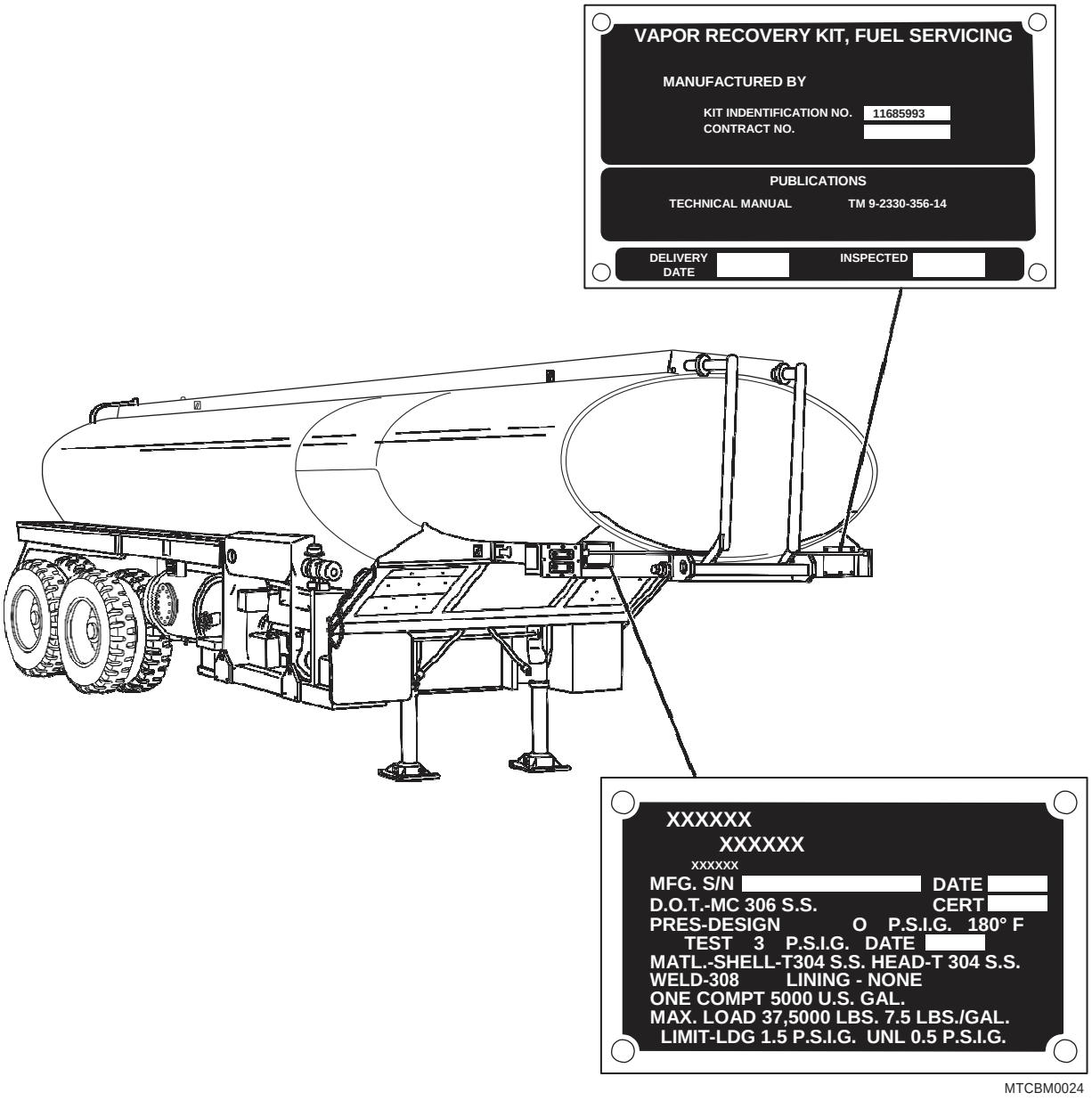


Figure 7. Front View Data Plates M969A1.

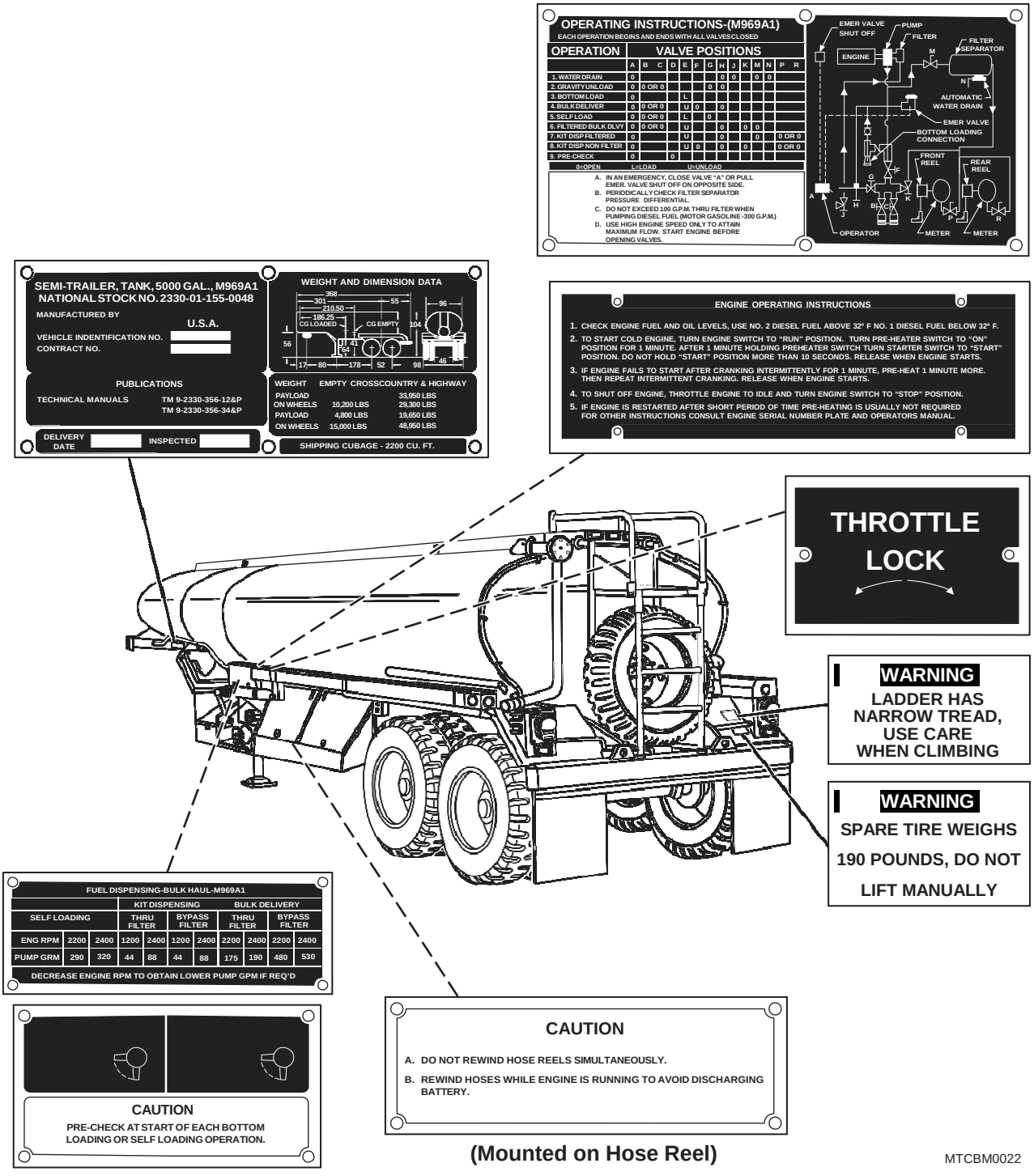


Figure 8. Rear View Data Plates M969A1.

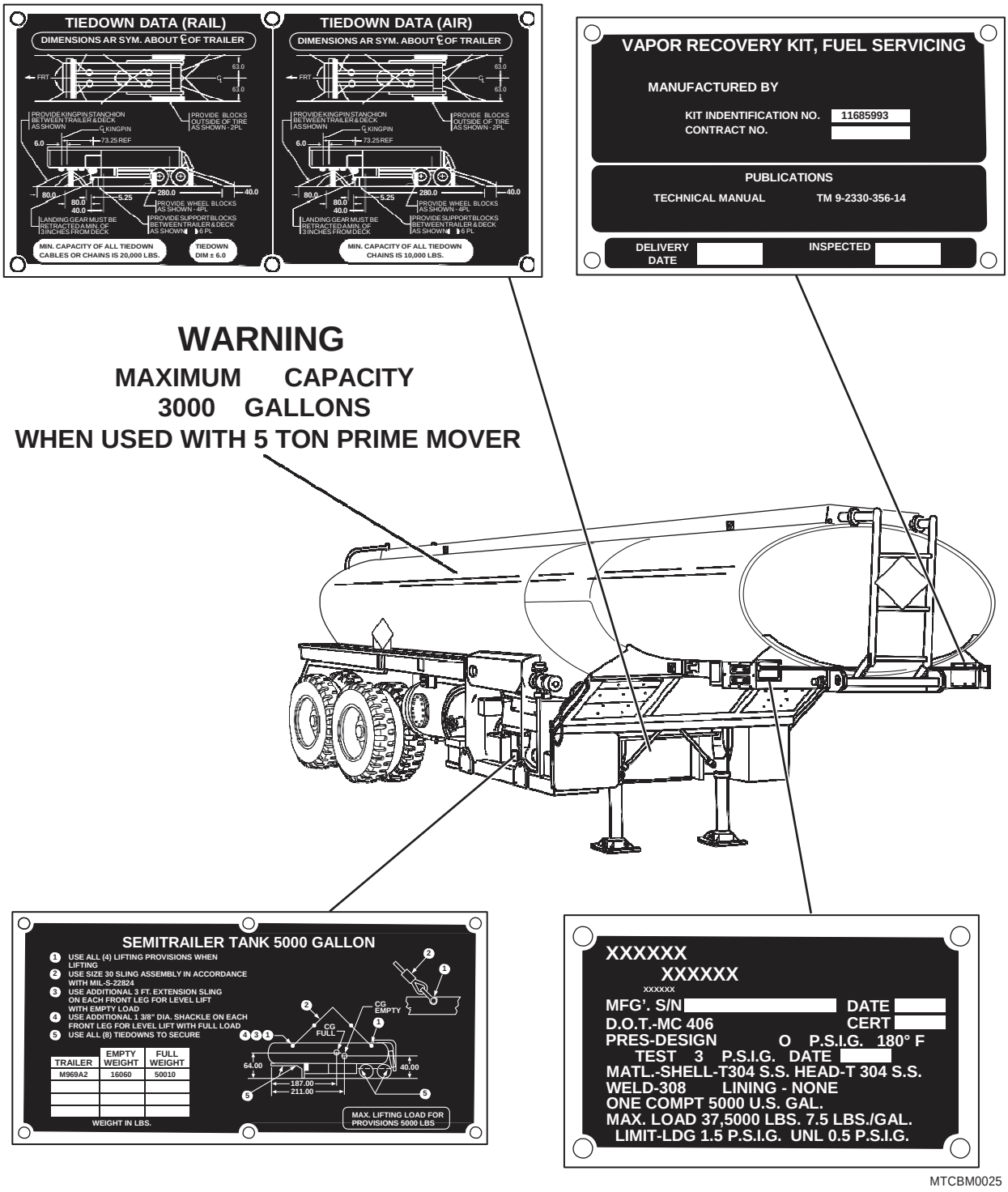


Figure 9. Front View Data Plates M969A2.

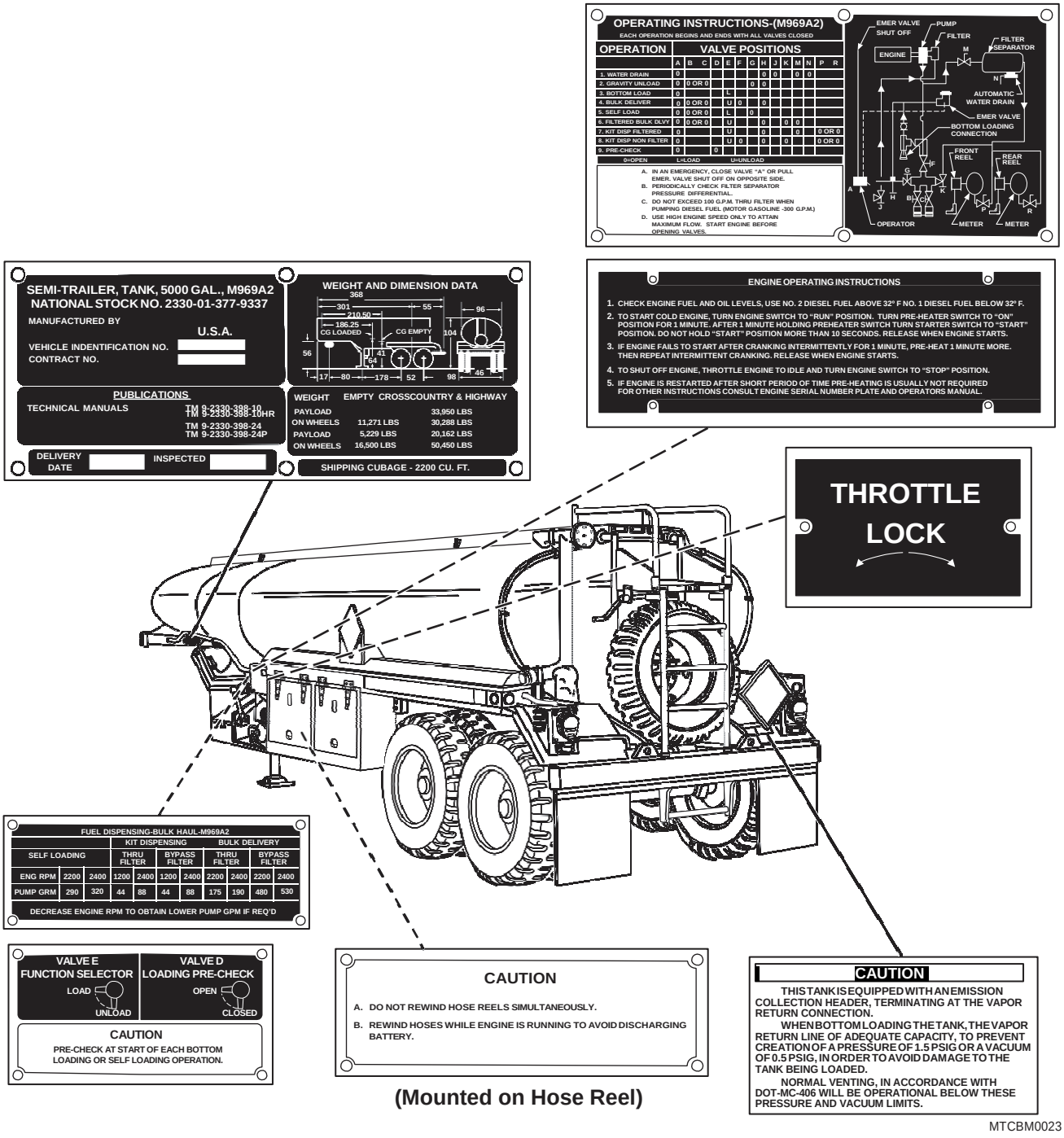


Figure 10. Rear View Data Plates M969A2.

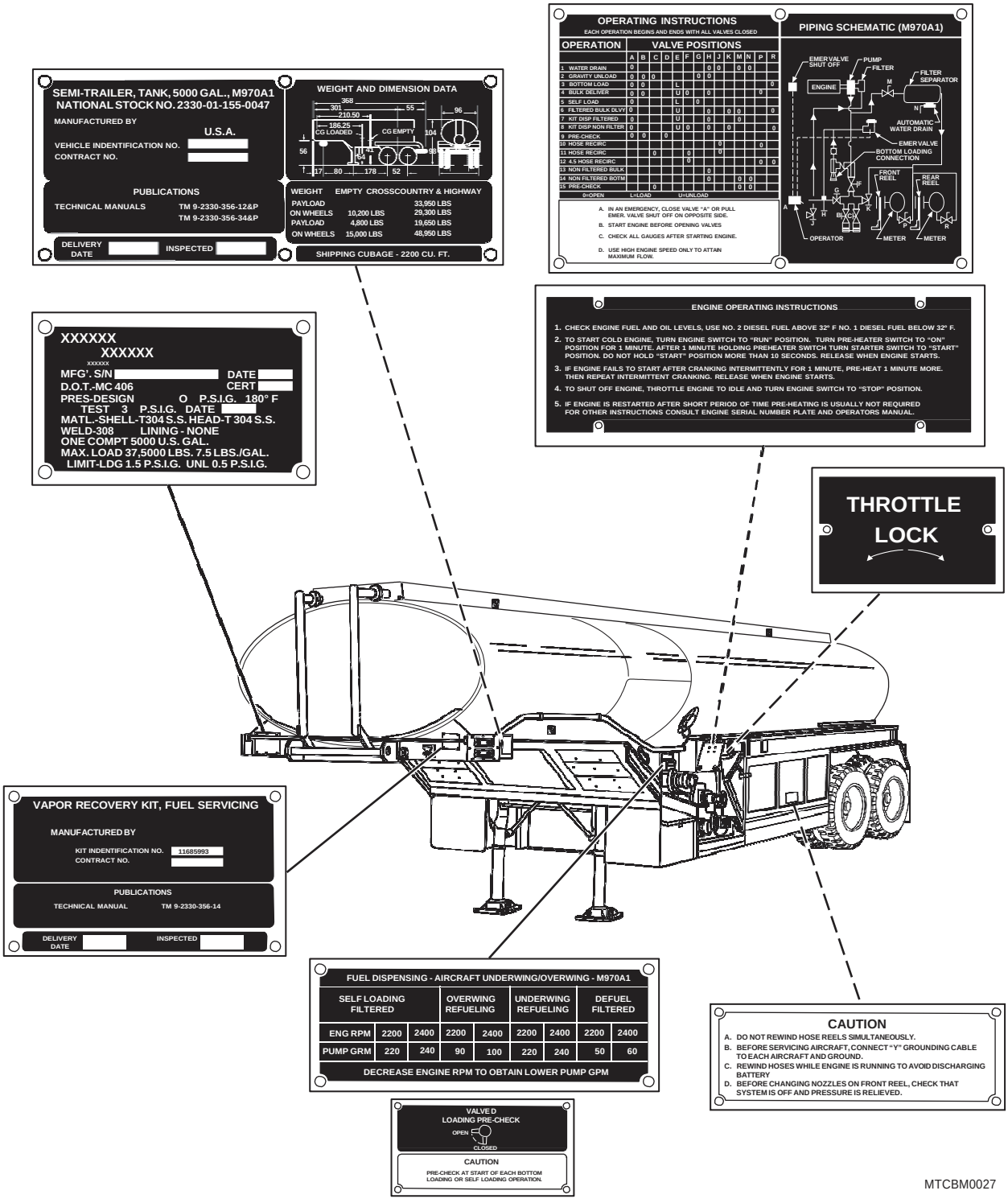


Figure 11. Front View Data Plates M970A1.

DIFFERENCES BETWEEN MODELS

Component	M967A1	M969A1	M969A2	M970A1
Dispensing Capability		X	X	X
Automotive Refueling		X	X	
Aircraft Refueling		X		X
Underwing Refueling				X
Overwing Refueling		X	X	X
Recirculation System				X
Filter/Separator		X	X	X
Hose Reel		X	X	X
4 in. Centrifugal Pump	X	X	X	
3 in. Centrifugal Pump				X
Deadman Control Valve				X

M967A1, M969A1, and M970A1

These models are the same except for the following: elastomeric-type drive coupling between the fuel-dispensing pump and the engine assembly, blackout lights, illuminated control panel, engine power supply circuit breakers, new axle, bogie, and braking system with an S-type cam brake actuating mechanism.

Marine Corps

The M970A1 dispensing pump, pump coupling, and control panel cover have been incorporated in the Marine Corps vehicles. These items are called out in TM 9-2330-339-23P.

Kits

During vehicle production, the following kits were installed on the Marine Corps vehicle:

- Lombardini Engine Installation Kit.
- Defueling Kit (Modification Kit, Engine Accessories), NSN 2910-01-093-7965, part number AE 200074-008, CAGEC 00624.
- Flow Limiter Assembly (for 1-1/2 in. hose), NSN 3835-01-101-7432, part number GTP 1540, CAGEC 32218, stored in the Storage Box.
- Vapor Recovery Kit, NSN 2590-00-138-8434, part number 1168 5993, CAGEC 19207.

DIFFERENCES BETWEEN MODELS - Continued

The vapor recovery system consists of a vapor-tight line running from a sealed hood on the emergency valve vent (directly behind the manhole cover) to the rear of the tank. The rollover rail on the roadside of the semitrailer is used as part of the line. The adapter on the end of the line is compatible with the 4 in. quick-disconnect vapor recovery connections at a majority of fuel depots.

- The system allows a fuel depot to collect or recover the vapors and gases that are present during the loading operation.
- Vapors and gases can also be cycled back to the semitrailer through the vapor recovery system during unloading operations.

The vapor recovery system was incorporated in the Marine Corps vehicles during production. The vapor recovery system is available as a kit that can be installed on all other models.

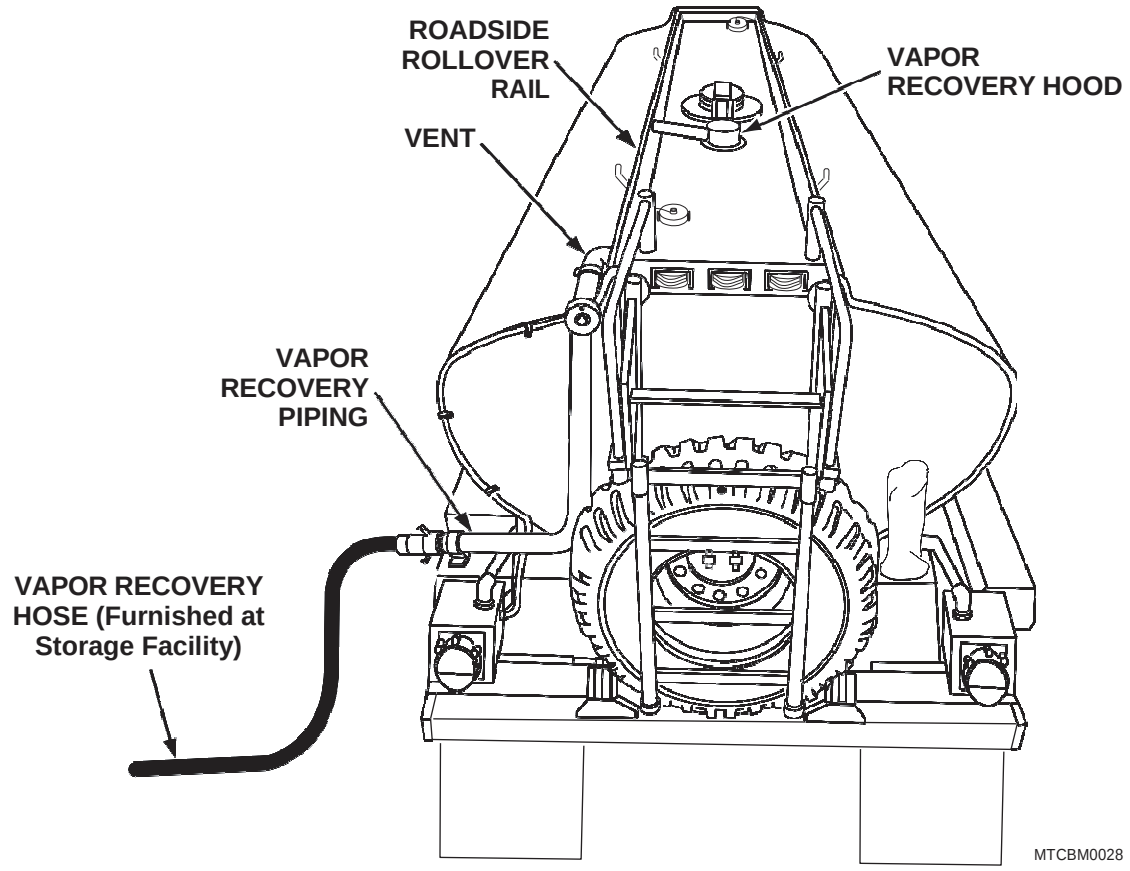


Figure 12. Vapor Recovery System.

EQUIPMENT DATA

At a slope of over 10 percent, slight leakage may occur. If a slope of over 10 percent is anticipated, reduce payload to 3,800 gal (14,384.6 L).

Table 5. Equipment Data.

All Models	
Tank Semitrailer Model Numbers:	
Bulk haul, self-load/unload	M967A1
Fuel dispensing, automotive	M969A1, M969A2
Fuel dispensing, under/overwing aircraft	M970A1
Angle of departure	60 degrees
Capacities of Tank (Vehicle Capacity):	
Hard surface road and cross-country	5000 gal (18,925 L)
20% maximum side slope without leakage	5000 gal (18,925 L)
10% maximum longitudinal slope without leakage	5000 gal (18,925 L)
Center of Gravity:	
Empty (vertical)	54 in. (137.16 cm)
Empty (horizontal from kingpin)	198 in. (502.92 cm)
Loaded (vertical)	66.5 in. (168.91 cm)
Loaded (horizontal from kingpin)	170 in. (431.80 cm)
Dimensions Overall:	
Height	104.5 in. (265.43 cm)
Length	366 in. (929.64 cm)
Width	96 in. (243.84 cm)
To outside of tires	97.75 in. (248.28 cm)

EQUIPMENT DATA - Continued

Table 5. Equipment Data - Continued.

Tires:	
Quantity (including spare)	9
Type	highway
Size	Load Range G, 11.00 X 22.5
Tire pressure, cross-country and sand	45 psi (310.3 kPa)
Tire pressure, hard surface roads	90 psi (620.5 kPa)
Axles and Suspension:	
Axle model number	A21 T-7CT7R-DW 10A
Capacity	25,000 Ib (11,350 kg)
Suspension model number	10476-01
Type	tandem overslung axle
Springs:	
Type	semi-elliptic multi-leaf
Shaft	semi-elliptic
Brakes	
Quantity	4 sets
Type	fail-safe
Actuation	full air S-type cam
Operating pressure	75-95 psi (517-655 kPa)
Drain Valve:	
Working pressure	120 psi (827.4 kPa)

EQUIPMENT DATA - Continued

Table 5. Equipment Data - Continued.

Electrical System-Engine:	
Type	12 V dc
Alternator (Model A001-2300, IB)	65 amps, belt drive
Batteries	2, 12 V dc each, connected in parallel
Electrical System-Vehicle:	
Voltage	24 V dc
Lamps:	
Clearance lights	3 cp
Taillights (service)	3 cp
Taillights (blackout)	3 cp
Stoplights (service)	32 cp
Engine:	
Manufacturer	Onan
Type	4-cylinder, 4-cycle, diesel, air-cooled
Model	DJC-MS4118W
Horsepower	27.5
Bore	3.25 in. (8.25 cm)
Stroke	3.625 in. (9.21 cm)
Oil Capacity Crankcase:	
With oil filter change	6.5 qt (6.151 L)
Displacement	289.85 cu in. (1870 cu cm)
Injection (firing) sequence	1-2-4-3

EQUIPMENT DATA - Continued

Table 5. Equipment Data - Continued.

Pump (4-inch Model), Bulk Haul, Self-Load/Unload, Overwing Automotive (M967A1, M969A1, and M969A2):	
Type	low pressure, centrifugal
Drive	shaft from engine
Drive (M969A2)	flexible coupling to engine
Prime Mover:	
5-ton	M818, M931, M931A1, M932, M932A1, M932A2, and M1088
10-ton (hard surface highway only)	M915, M915A1, and M915A2
Track:	
Center to center of dual wheels	72 in. (182.88 cm)
Transfer Hose:	
Type	flexible
Storage	trough
Engine:	
Manufacturer	Lombardini
Type	3-cylinder, 3-cycle, diesel, air-cooled
Model	11LD626-3
Horsepower	39
Bore	3.75 in. (9.5 cm)
Stroke	3.467 in. (8.8 cm)
Oil Capacity Crankcase:	
With oil filter change	5.29 qt (5.0 L)
Displacement	120 cu in. (774 cu cm)
Injection (firing) sequence	1-2-3

EQUIPMENT DATA - Continued

Table 5. Equipment Data - Continued.

Throttle Control:	
Length	100 in. (254 cm)
Model	flexible
Type	push-pull with locking handle
Engine Air Cleaner:	
Capacity (Air-flow)	115 cpm at 12 in. H_20
Landing Gear:	
Type	vertical support with footpads
Operation	hand crank, two-speeds
M967A1	
Bridge Classification:	
Empty weight with Prime Mover	Class 13
Empty weight without Prime Mover	Class 6
Cross-country loaded with Prime Mover	Class 25
Cross-country loaded without Prime Mover	Class 18
Highway loaded with Prime Mover	Class 29
Highway loaded without Prime Mover	Class 21
Weights:	
Empty	13,745 lb (6240.2 kg)
Loaded	47,695 lb (21,224.5 kg)

EQUIPMENT DATA - Continued

Table 5. Equipment Data - Continued.

M969A1/A2	
Bridge Classification:	
Empty weight with Prime Mover	Class 14
Empty weight without Prime Mover	Class 6
Cross-country loaded with Prime Mover	Class 25
Cross-country loaded without Prime Mover	Class 18
Highway loaded with Prime Mover	Class 30
Highway loaded without Prime Mover	Class 22
Fuel-dispensing Hose (Automotive, Overwing):	
Length	50 ft (15.2 m)
Quantity	2
Nominal size	1.25 in. (3.18 cm)
Meter:	
Quantity	2
Type	full metering
Maximum Capacity	100 gpm
M969A1	
Weights:	
Empty	15,580 lb (7067.0 kg)
Loaded	49,530 lb (22,466.4 kg)
M969A2	
Weights:	
Empty	16,350 lb (7416.24 kg)
Loaded	50,010 lb (22,684.2 kg)

EQUIPMENT DATA - Continued

Table 5. Equipment Data - Continued.

Filter/Separator:	
Construction	aluminum
Rating	300 gpm at 150 psi (1034 kPa)
Differential pressure gage psi indicator	0-25 psid (0-172 kPa)
Bulk Fuel Servicing Hose (Two with Male and Female Connectors, One with Female Connector, Both Ends):	
Length	14 ft (4.27 m)
Quantity	3
Nominal Size	4 in. (10.1 cm)
Single Point, Pressure Shut-Off with Deadman Controls:	
Nominal size	2.5 in. (6.35 cm)
Function	underwing/recirculation/purge/self-load/defueling
Quantity	1
Capacity	300 gpm
Closed Circuit Pressure Shut-Off:	
Nominal size	1.5 in. (3.81 cm)
Function	Helicopter only
Quantity	1
Capacity	100 gpm
Hose Reels:	
Type	electric, full control and manual crank

EQUIPMENT DATA - Continued

Table 5. Equipment Data - Continued.

M970A1	
Bridge Classification:	
Empty weight with Prime Mover	Class 15
Empty weight without Prime Mover	Class 7
Cross-country loaded with Prime Mover	Class 26
Cross-country loaded without Prime Mover	Class 19
Highway loaded with Prime Mover	Class 30
Highway loaded without Prime Mover	Class 22
Deadman Control (Underwing):	
Size and material	3 in. (76.2 mm) aluminum
Fuel-Dispensing Hose (Overwing):	
Length	50 ft (15.25 m)
Quantity	1
Nominal size	1.5 in. (3.81 cm)
Fuel Dispensing Hose (Underwing):	
Length	50 ft (15.25 m)
Quantity	1
Nominal size	2.5 in. (6.35 cm)
Meter:	
Quantity	1
Type	full metering
Maximum capacity	300 gpm
Weights:	
Empty	15,460 lb (7012.5 kg)
Loaded	49,410 lb (22,412 kg)

EQUIPMENT DATA - Continued

Table 5. Equipment Data - Continued.

Ground Clearance:	
Kingpin Location:	
From nose of vehicle	28 in. (71.12 cm)
To landing gear	80 in. (203.2 cm)
Portable Fire Extinguisher:	
Type	Purple-K, dry chemical
Size	10 lb (4.5 kg)
Number per vehicle	2
Fuel-Dispensing Nozzles Trigger Controls (Used with Deadman Control):	
Nominal size	1.5 in. (3.81 cm)
Function	automotive/overwing/purge with adapter
Quantity	1
Capacity	100 gpm
Pump (3-inch Model) Underwing/Overwing:	
Type	high pressure, centrifugal
Drive	shaft from engine
Emergency Valve Control:	full release
Type	
Control	flexible cable
Speed Limits:	
Highway and Secondary Roads	40 mph (64 kph)
Cross-country Roads	35 mph (56 kph)
Sand/Snow	25 mph (40 kph)
Icy Roads	12 mph (19.2 kph)

END OF WORK PACKAGE

OPERATOR MAINTENANCE
THEORY OF OPERATION

EQUIPMENT OPERATION

The purpose of the M900 Series 5000-gallon tank semitrailers is to provide the means for automotive refueling, under/overwing aircraft refueling or bulk fuel hauling and delivery. All semitrailer models can be loaded through the top or bottom fill opening.

PUMP AND ENGINE ASSEMBLY (ALL MODELS)

NOTE

The Lombardini and Kohler engines models are manufactured by the same company.

ENGINE: The M900 Series trailers are equipped with either the 4-cylinder, 27.5 horsepower Onan, or 3-cylinder, 39 horsepower Lombardini diesel engine (Figure 1, Item 1). The M969A2 engine provides power through a flexible coupling to the centrifugal pump (Figure 1, Item 2). All other models provide shaft-driven power to centrifugal pump (Figure 1, Item 2).

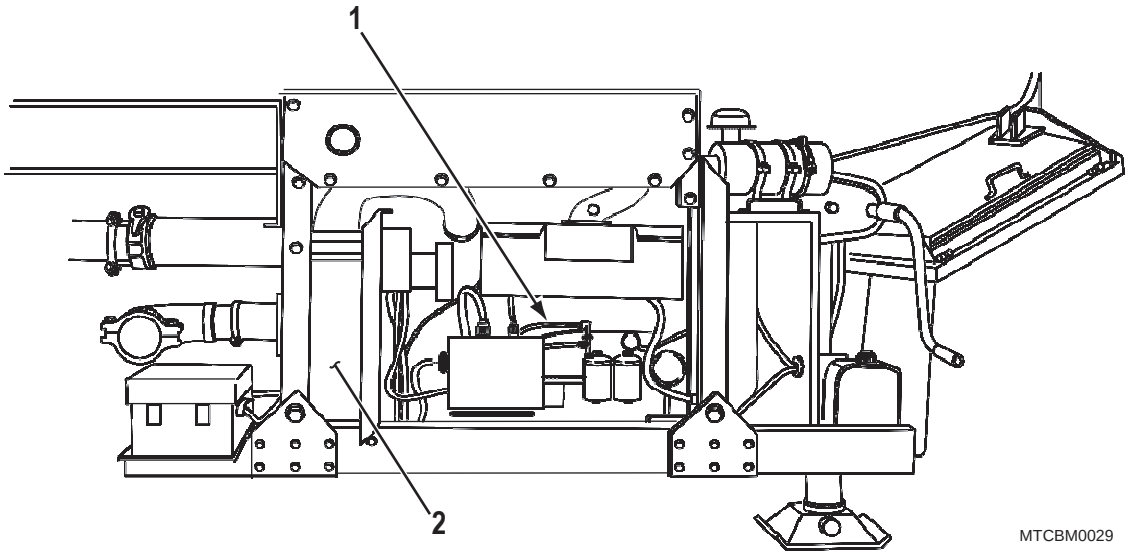


Figure 1. Engine and Pump.

PUMP: The M967A1, M969A1, and M969A2 semitrailers are equipped with a 4 in. (10.2 cm), self-priming, low head, low-pressure centrifugal pump (Figure 1, Item 2). The centrifugal pump (Figure 1, Item 2) provides a self-load rate of up to 300 gpm and a bulk delivery rate of up to 600 gpm for M967A1 semitrailer and a flow rate for metered fuel (gasoline or diesel) delivery of up to 60 gpm through one or both fuel dispensing nozzles for M969A1 and M969A2 semitrailers.

The M970A1 semitrailer is equipped with a 3 in. (7.7 cm), high-pressure centrifugal pump (Figure 1, Item 2) designed primarily for under/overwing refueling of aircraft.

FILTER/SEPARATION (M969A1, M969A2, and M970A1)

FILTER/SEPARATOR: Provides filtering capabilities to remove contamination and condensation of fuel. The filter/separator consists of an aluminum tank (Figure 2, Item 1) containing 15 filter elements (Figure 2, Item 5) and five second-stage water stripper elements (Figure 2, Item 3). Fuel under pressure from the pump enters the filter tank inlet (Figure 2, Item 7) and flows through the 15 filter elements (Figure 2, Item 5), where solid particles are removed. The fuel then flows through the five second-stage water stripper elements (Figure 2, Item 3), which further filter out smaller solid particles and coalesce water particles to be collected in the filter sump (Figure 2, Item 8). Coalescence is a process by which many small droplets of free water in the fuel are collected to form larger water drops. These large water drops are then released into the filter sump (Figure 2, Item 8).

AUTOMATIC WATER DRAIN VALVE: Allows water collected in the filter sump (Figure 2, Item 8) to be automatically ejected. The drain valve (Figure 2, Item 10) has a ball float that will float only in water and not in any type of fuel. Automatic water drain for the M969A1 and M969A2 is accomplished differently than that of the M970A1.

As water accumulates in the filter sump (Figure 2, Item 8) of the M969A1 and M969A2, a float rises. When the float reaches a certain level, a valve will open in the automatic drain valve (Figure 2, Item 10), allowing pump pressure to be applied to a diaphragm valve, opening the automatic drain valve (Figure 2, Item 10). Water is then ejected out of the filter sump (Figure 2, Item 8) through the automatic drain valve (Figure 2, Item 10). As water is being ejected, fuel flow is continued.

As water accumulates in the filter sump (Figure 2, Item 8) of the M970A1, a float rises. When the float reaches a certain level, a valve will open in the automatic drain valve (Figure 2, Item 10), allowing pump pressure to be applied to a diaphragm valve in the automatic drain valve and to the pilot control on the 3 in. (7.7 cm) flow control valve. The pump pressure opens the diaphragm valve and closes the 3 in. (7.7 cm) flow control valve. Fuel flow is then shut off, preventing dispensing of water-contaminated fuel, and the water in the filter sump is passed through the automatic drain valve. When the fuel flow is stopped by closing of the 3 in. (7.7 cm) flow control valve, no coalescing occurs and the automatic drain valve will continue passing water until the float lowers. When the float lowers, the water drain valve closes and the 3 in. (7.7 cm) flow control valve opens. Pressure trapped in the line to the automatic drain valve diaphragm and pilot control of the 3 in. (7.7 cm) control valve prevents resumption of fuel flow. To resume fuel flow, the bleed line (Figure 2, Item 6) from the automatic drain valve diaphragm and pilot control will relieve the pressure at the discharge side of the water drain valve (Figure 2, Item 4).

MANUAL DRAIN VALVE: Used primarily during cold weather operations. Water accumulated in the filter sump may freeze. It is important that the manual drain valve on the filter sump be opened after each operation to drain the water accumulation. Be sure to close the manual drain valve after draining.

GO-NO-GO FUSES: Each of the five second-stage water stripper elements (Figure 2, Item 3) is equipped with three Go-No-Go fuses (Figure 2, Item 9). These fuses are fuel contaminant monitoring devices located “downstream" of the second stage. The fuses restrict the fuel flow when small amounts of water and solid contaminants are present in the fuel stream.

FILTER/SEPARATION (M969A1, M969A2, and M970A1) - Continued

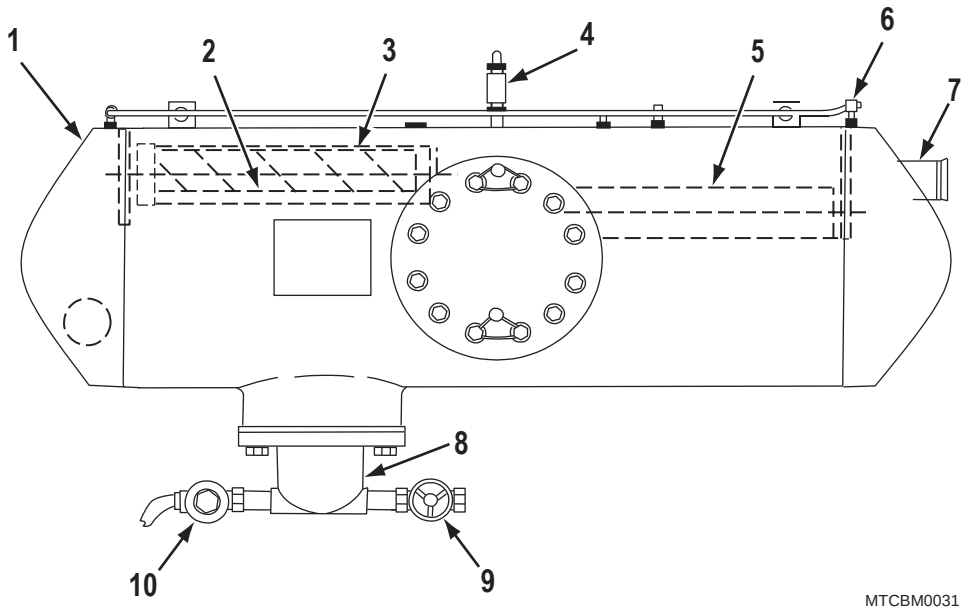


Figure 2. Filter/Separator.

PRESSURE RELIEF VALVE: Automatically opens to relieve internal pressure of filter/separator when pressure exceeds 150 psi (1034.2 kPa). Pressure relief valve vents to the atmosphere.

VAPOR RECOVERY SYSTEM: The vapor recovery system allows a fuel depot to collect or recover the vapors and gases that are present during loading operations. and allows the semitrailer to collect or recover the vapors and gases present during unloading operations. This system consists of a sealed vapor-tight line from the vapor recovery hood on the emergency valve vent (directly behind the manhole cover) to the rear of the tank. The rollover rail on the roadside of the semitrailer is used as part of the line. The adapter on the end of the line is compatible with the 4 in. (10.2 cm) vapor recovery quick-disconnect connections at a majority of the fuel depots.

END OF WORK PACKAGE

CHAPTER 2

OPERATOR INSTRUCTIONS

OPERATOR MAINTENANCE
DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

INTRODUCTION

The tables and component locator views in this work package describe the semitrailer engine control panel, filters, hoses, valves, piping, and dispensing components for all of the semitrailer models described in this manual. The operator/crew should become thoroughly familiar with all of these controls before beginning any fuel servicing operation. Compare the figures in this work package with the corresponding piping schematics mounted on the storage box cover for each semitrailer model.

Table 1: Describes the functions and gages of the **Engine Control Panel**, located on the roadside of the semitrailer above the piping assembly.

Table 2: Describes the **Filter/Separator** components for Models M969A1, M969A2, and M970A1.

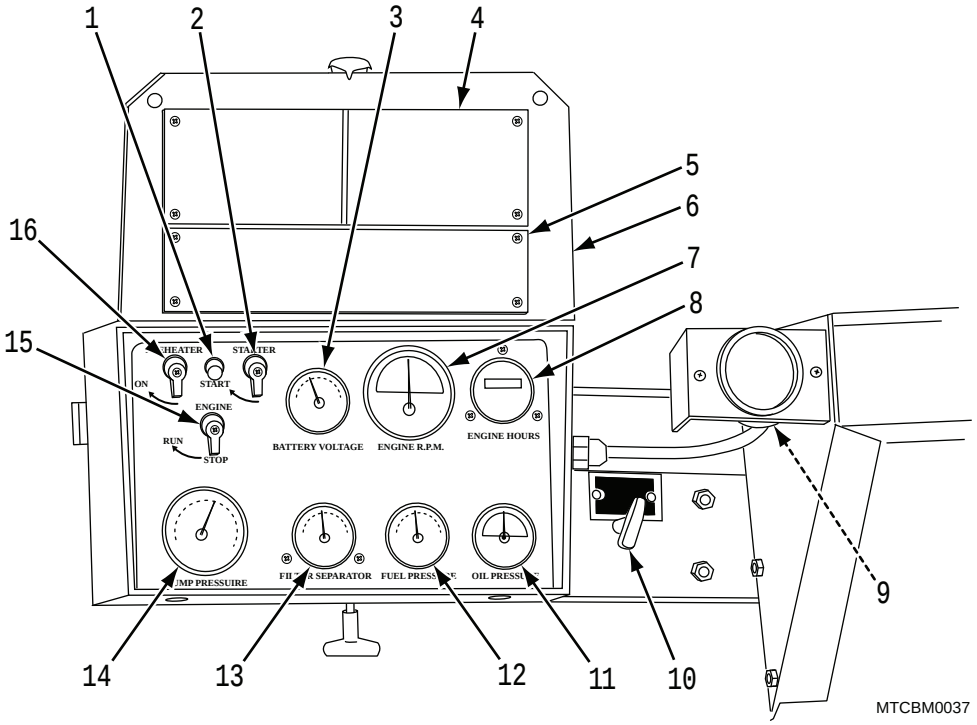
Table 3: Covers the contents of the **Hose Reel Cabinet** for Models M969A1 and M969A2.

Table 4: Describes the contents of the **Hose Reel Cabinet** for Model M970A1.

Table 5: Shows the **Piping Control Assembly** for Models M969A1 and M969A2.

Table 6: Describes the **Piping Control Assembly** for Model M970A1. The M970A1 piping control assembly contains a 4 in. (10.2 cm) pilot-operated control valve, and the tank is equipped with a Defuel kit. It has a different C valve configuration than the other models.

Table 1. Engine Control Panel.

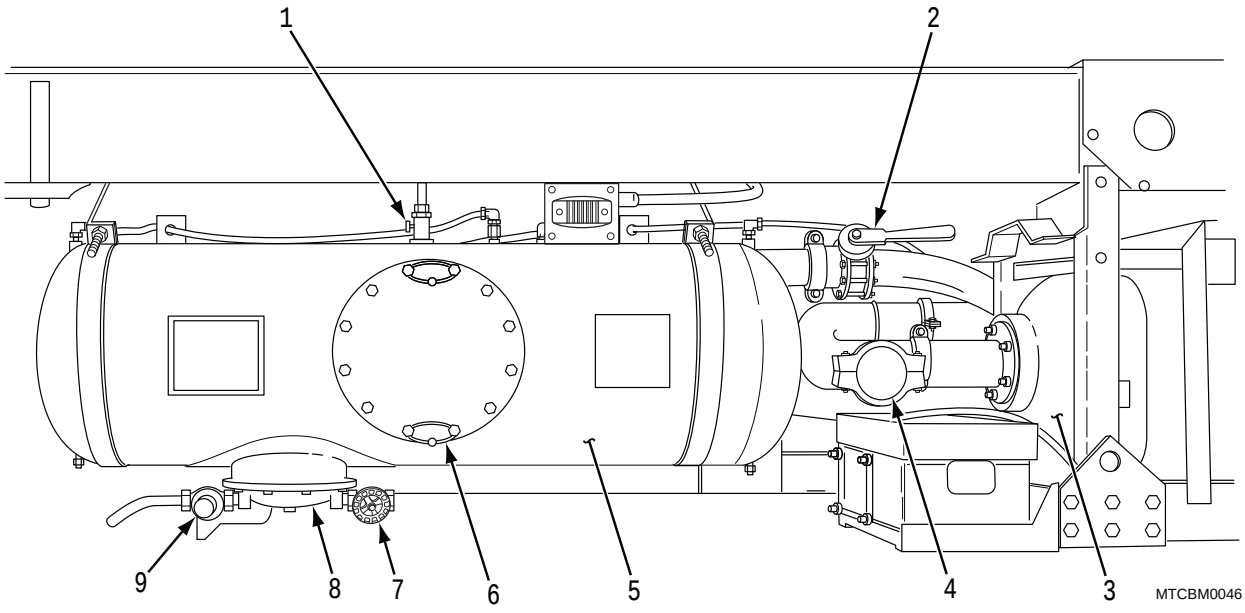


Key	Control/Indicator	Function
1	Indicator Light	This should turn on when preheater switch is turned to ON position. If light does not come on, it indicates there is no current flow to the manifold heaters and glow plugs.
2	Starter Switch	Engages starter motor to turn and start the engine. (Engine switch must be in RUN position.)
3	Battery Voltage Gage	Indicates battery operating voltage. Normal indication is 12-14 V dc with engine running.
4	Instruction Plate, Engine Operating	Contains engine operating instructions.
5	Instruction Plate, Valve Operating	Contains valve operating instructions.
6	Control Panel Cover	Protects control panel when not in use.

Table 1. Engine Control Panel - Continued.

Key	Control/Indicator	Function
7	Engine RPM (Tachometer)	Indicates engine RPM. Use with flow rate/RPM data plate to select desired flow rate.
8	Engine Hours Meter	Indicates engine running time.
9	Control Panel Light and Switch	To illuminate the control panel, activate the light switch at the bottom of the light.
10	Engine Throttle	Controls and sets engine speed. Pull out the handle to selected setting, then rotate it clockwise to lock it in position.
11	Oil Pressure Gage	Indicates pressure in engine lubrication system. Normal indication is 30-40 psi (207-276 kPa) when engine is warm and running.
12	Fuel Pressure Gage	Indicates pressure in the fuel injection system. Normal indication is 12-14 psi (83-97 kPa). Lomardini engines do not utilize this gage.
13	Filter/Separator Gage	Indicates amount of restriction in filter/separator (M969A1, M969A2, and M970A1).
14	Pump Pressure Gage	Indicates pressure in the pump discharge line. Normal operating pressure is 30 psi (207 kPa) for the 4 in. lowhead pump (M967A1, M969A1, and M969A2) and 65 psi (448 kPa) for the 3 in. high pressure pump (M970A1).
15	Preheater Switch	Connects battery voltage to glow plugs in engine intake manifold to preheat the engine. (Engine switch must be in RUN position.)
16	Engine Switch	In RUN position, energizes engine electrical system and fuel pumps to permit engine operation. STOP position cuts off fuel supply and stops the engine.

Table 2. Filter/Separator M969A1, M969A2, and M970A1.

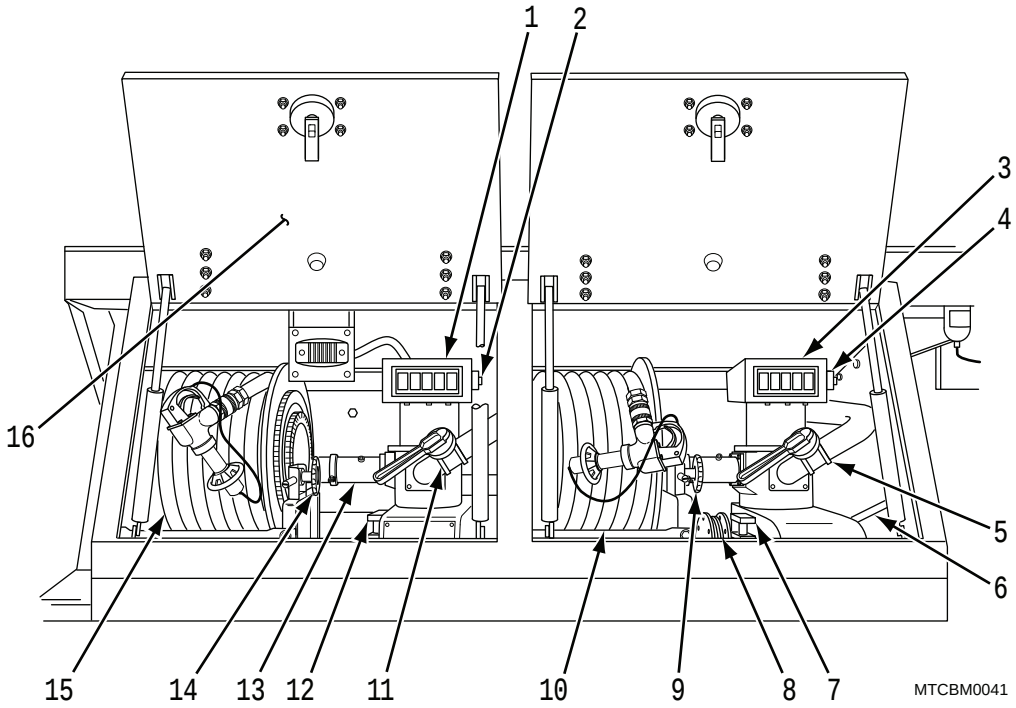


Key	Control/Indicator	Function
1	Relief Valve	Gives pressure/vacuum relief during loading or unloading.
2	Valve M	Controls fuel flow from the pump outlet to the inlet of the filter/separator. Valve is open when handle is parallel to pipe.
3	Pump	With engine running, provides fuel flow and pressure to system.

Table 2. Filter/Separator M969A1, M969A2, and M970A1 - Continued.

Key	Control/Indicator	Function
4	Pump Inlet Screen	Catches large particles, preventing damage to pump assembly.
5	Filter/Separator	Filters particulates and separates water from fuel when fuel flows through system.
6	Lead Wire Seal	Gives operator a quick method of checking for filter/separator tampering.
7	Valve N	The manual drain for the sump on the filter/separator.
8	Float Assembly	Automaticaly shuts off fuel flow when tank is full.
9	Automatic Drain Valve	Automatically drains water from filter sump when water accumulates to a certain level.

Table 3. Hose Reel Cabinet M969A1 and M969A2.

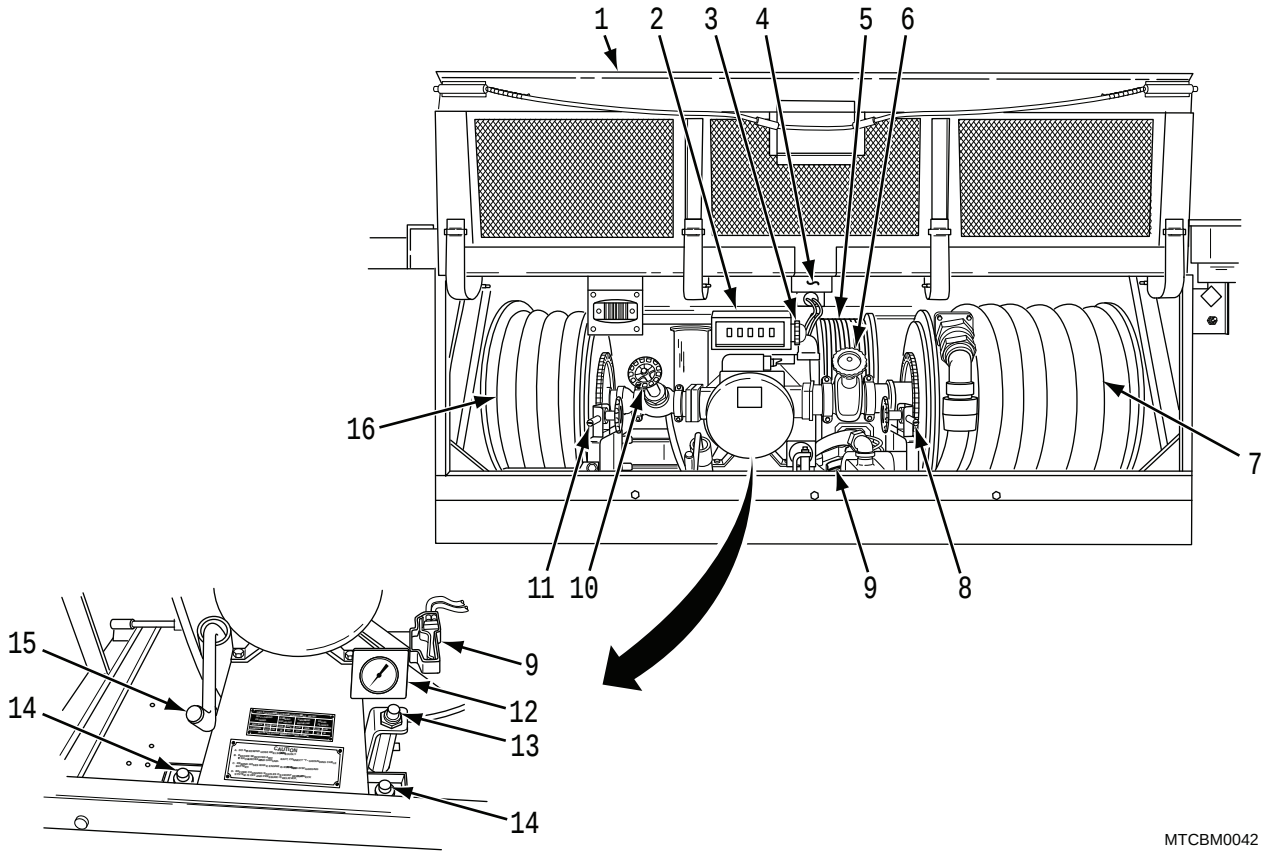


Key	Control/Indicator	Function
1	Front Meter	Records amount of fuel being dispensed through front hose.
2	Front Meter Reset Knob	Push in and turn clockwise to reset meter.
3	Rear Meter	Records amount of fuel being dispensed through rear hose.
4	Rear Meter Reset Knob	Push in and turn clockwise to reset meter.
5	Valve R	Permits fuel flow through the rear hose reel. Valve is open when handle is parallel to pipe.
6	Hose Reel Rewind Crank	Installed on rewind shaft of hose reel, the crank is used to manually rewind hose reels (turn clockwise for left hose reel; turn counterclockwise for right hose reel). Stored in hose reel cabinet.

Table 3. Hose Reel Cabinet M969A1 and M969A2 - Continued.

Key	Control/Indicator	Function
7	Rear Hose Reel Rewind Button	Used to electrically rewind hose reels. (Use while engine is running to avoid discharging battery.)
8	Static Reel	The static ground cable is pulled from the static reel and attached to unit being serviced and to a ground plug, stud, or clamp. The reel has an automatic locking device which engages when cable is extended to the desired length and releases when cable is pulled out again. The reel is spring loaded to rewind automatically.
9	Rear Hose Reel Lock	Locks hose reel in position.
10	Rear Hose Reel	Stores and rewinds rear 1-1/4 in. (3.2 cm) hose.
11	Valve P	Permits fuel flow through the front hose reel. Valve is open when handle is parallel to pipe.
12	Front Hose Reel Rewind Button	Used to electrically rewind hose reels. (Use while engine is running to avoid discharging battery.)
13	Meter Outlet Nipple	Connects meter to hose reel.
14	Front Hose Reel Lock	Turn handwheel and hose reel clockwise to lock hose reel in position. Turn handwheel counterclockwise to release hose reel lock.
15	Front Hose Reel	Stores and rewinds front 1-1/4 in. (3.2 cm) hose.
16	Hose Reel Cabinet Door Assembly	Covers hose reel cabinet.

Table 4. Hose Reel Cabinet M970A1.

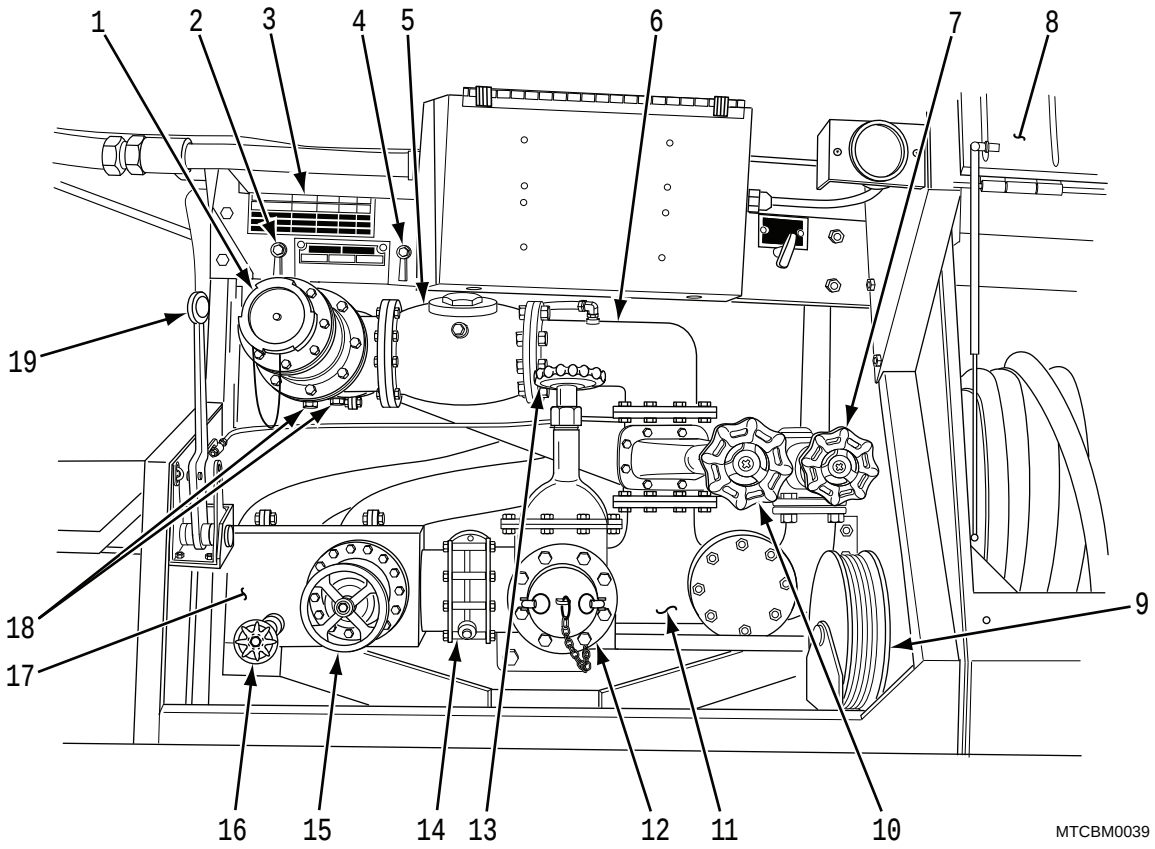


Key	Control/Indicator	Function
1	Cabinet Door	Covers hose reel cabinet.
2	Meter	Records amount of fuel being dispensed.
3	Meter Reset Knob	Push in and turn clockwise to reset meter.
4	Brake Interlock Valve	Prevents the tanker from being moved when the hose reel cabinet door is open by locking the brakes until the door is closed.
5	Deadman Control Hose Reel	The reel has an automatic locking device, which engages when hoses are extended to the desired length and releases when hoses are pulled out again. The reel is spring loaded to rewind automatically.
6	Valve R	Permits fuel flow through the rear hose reel.

Table 4. Hose Reel Cabinet M970A1 - Continued.

Key	Control/Indicator	Function
7	Hose Reel	Stores and rewinds 2-1/2 in. (6.4 cm) hose.
8	Hose Reel Lock	Locks hose reel in position by turning handwheel on hose reel clockwise. Releases hose reel lock by turning handwheel counterclockwise.
9	Valve S, Deadman Control	Hand-held valve that operates a shut-off valve (3 in. (7.6 cm) control valve) in the hose reel supply line. It is only used when the 2-1/2 in. (6.4 cm) hose is in service.
10	Valve P	Permits fuel flow through the front hose reel.
11	Hose Reel Lock	Lock hose reel in position by turning handwheel on hose reel clockwise. Release hose reel lock by turning handwheel counterclockwise.
12	Meter Inlet Gage (0-80 psi)	Displays operating system pressure.
13	Deadman Release Plunger	This control deactivates the deadman control system after the 2-1/2 in. (6.4 cm) hose has been used, allowing fuel flow to the 1-1/2 in. (3.8 cm) hose.
14	Hose Reel Rewind Buttons	Used to electrically rewind hose reels. (Use while engine is running to avoid discharging battery.)
15	Hose Reel Rewind Crank	Install crank on rewind shaft of hose reel to manually rewind hose reels (turn clockwise for left hose reel; turn counterclockwise for right hose reel). Stored in hose reel cabinet.
16	Hose Reel	Stores and rewinds 1-1/2 in. (3.8 cm) hose.

Table 5. Piping Control Assembly M967A1, M969A1, and M969A2.

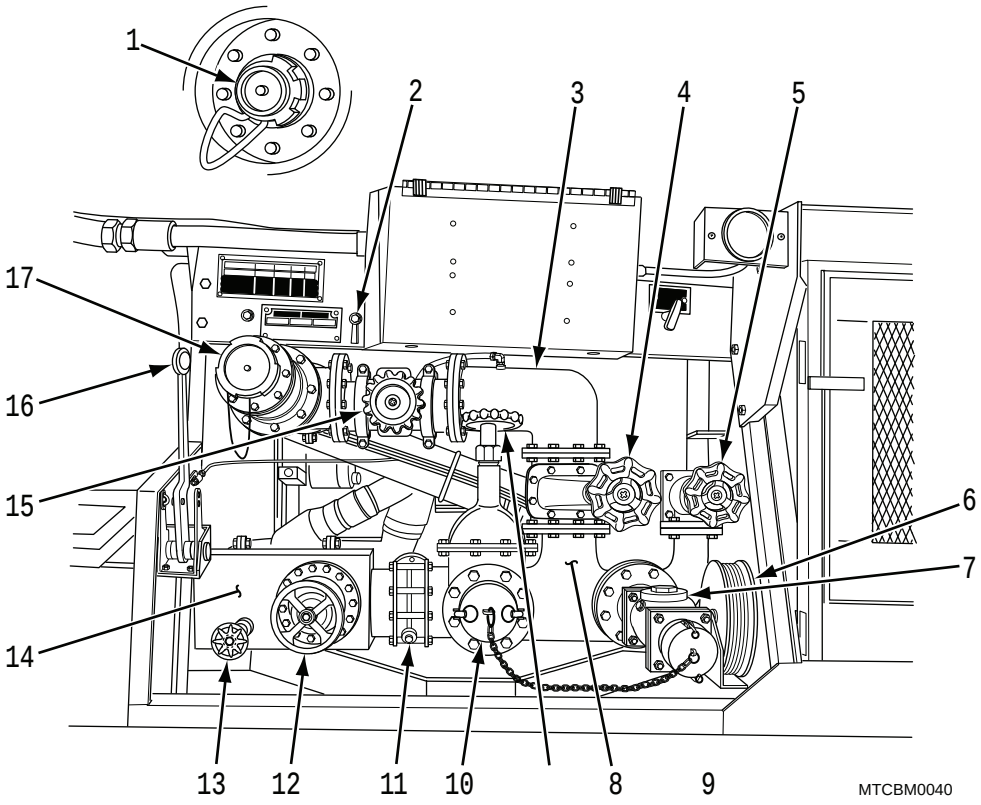


Key	Control/Indicator	Function
1	Bottom Loading Adapter (D-1)	Allows tanker to be closed-circuit loaded/unloaded from the bottom.
2	Valve E	Located next to the precheck valve (D). Provides load/unload selection.
3	Fuel Dispensing Instruction Plate	Provides engine RPM and pump gpm requirements during fuel dispensing operations.
4	Valve D, Precheck	Fastened to the frame above the piping control assembly. Provides a way to check the shut-off float for proper functioning.
5	Check Valve	Eliminates backflow of fuel during bottom loading.
6	Top Manifold	Directs fuel to various valves.

Table 5. Piping Control Assembly M967A1, M969A1, and M969A2 - Continued.

Key	Control/Indicator	Function
7	Valve K (M969A1 and M969A2)	Located on rear manifold. Allows fuel flow between the bulk delivery connections and hose reel assembly.
8	Hose Reel Cabinet Door Assembly	Covers hose reel cabinet.
9	Static Reel	The static ground cable is pulled from the static reel and attached to unit being serviced, and to a ground plug, stud, or clamp. The reel has an automatic locking device which engages when cable is extended to the desired length and releases when cable is pulled out again. The reel is spring loaded to rewind automatically.
10	Valve F	Opens the pump outlet line to permit bulk fuel delivery (nonfiltered).
11	Rear Manifold	Directs fuel to various valves.
12	Outlet B	Main outlet for bulk fuel delivery.
13	Valve B	Fastened to the rear manifold. Controls the opening for bulk delivery connections.
14	Valve G	Located between the front and rear manifolds. Permits gravity unloading and self-loading. Valve is open when handle is parallel to pipe.
15	Valve H	Located in the front manifold. Permits fuel flow through the manifold to the pump.
16	Valve J	Allows water to drain from front manifold.
17	Front Manifold	Directs fuel flow to valve(s).
18	Top Manifold Drain Cock (2) (M969A2)	Permits water to drain from top manifold.
19	Valve A, Emergency Valve Control Handle	Mechanically controls both the operator emergency valve on the outlet sump and the vapor vent on top of semitrailer.

Table 6. Piping Control Assembly M970A1.



Key	Control/Indicator	Function
1	Recirculation Fitting	Used when fuel in tanker must be refiltered using the on-board filter/ separator and pump system.
2	Valve D, Precheck	Fastened to the frame above the piping control assembly. Provides a way to check the shut-off float for proper functioning.
3	Top Manifold	Directs fuel flow to valve(s).
4	Valve F	Opens the pump outlet line to permit bulk fuel delivery (nonfiltered).
5	Valve K	Located on the rear manifold. Allows fuel flow between the bulk delivery connections and the filtering/dispensing system.

Table 6. Piping Control Assembly M970A1 - Continued.

Key	Control/Indicator	Function
6	Static Reel	The static ground cable is pulled from the static reel and attached to unit being serviced and to a ground plug, stud, or clamp. The reel has an automatic locking device, which engages when cable is extended to the desired length and releases when cable is pulled out again. The reel is spring loaded to rewind automatically.
7	Valve C	Attached to the rear manifold. It's a check valve, controlling the opening for defueling operation.
8	Rear Manifold	Allows fuel flow to valve(s).
9	Valve B	Fastened to the rear manifold. Controls the opening for bulk delivery connections.
10	Outlet B	Main outlet for bulk fuel delivery.
11	Valve G	Located between the front and rear manifolds. Permits gravity unloading and self-loading. Valve is open when handle is parallel to pipe.
12	Valve H	Located in the front manifold. Permits fuel flow through the manifold to the pump.
13	Valve J	Allows water to drain from front manifold.
14	Front Manifold	Allows fuel flow to valve(s).
15	Valve E	Allows evacuation of fuel from the dispensing systems.
16	Valve A	Mechanically controls both the Operator emergency valve on the outlet sump and the vapor vent on top of semitrailer.
17	Bottom Load/Self-Load/Defueling	Allows tanker to load fuel by bottom loading or adapter self-loading. Also allows tanker to defuel.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
GENERAL

INITIAL SETUP:

Not Applicable

WARNING

If used incorrectly, this equipment can cause severe injury or death. Those who use and maintain the equipment should be trained in its proper use, should be warned of its dangers, and should read this entire manual before attempting to set up, operate, adjust, or service the equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

A Department of the Army waiver, #96-3, authorizes the 5000-gallon semitrailers to carry 5000 gallons of fuel (NOT WATER) when towed with the M818, M931, M931A1, M931A2, M932, M932A1, M932A2, and M1088 truck tractors; operating on hard surfaces and gravel or dirt roads. Cross-country terrain payload is limited to 3000 gallons of fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

To prevent injury to personnel or damage to equipment, speeds are limited to:

Highway and secondary roads.....40 mph (65 km/h)

Cross-country roads.....35 mph (56 km/h)

Sand/Snow .....25 mph (40 km/h)

Icy roads .....12 mph (19 km/h)

Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Rear tire pressure for the M818, M931, M931A1, M931A2, M932, M932A1, M932A2, and M1088 truck tractors must be increased to 70 psi (482.63 kPa). Truck tractors equipped with a Central Tire Inflation System (CTIS) must have the CTIS disabled (refer to vehicle Technical Manual). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Copies of the waiver can be obtained from TACOM Logistics Assistance Representative (LAR). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

This section provides operator/crew instructions for the operation and proper use of semitrailers under usual conditions. Operations common to all models are described first, followed by those operations which pertain to a particular model.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST

INITIAL SETUP:

Not Applicable

INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST

WARNING

Equipment, safety devices, and working areas must be inspected frequently to ensure personal and operational safety and to correct potential or actual hazards. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. The semitrailer must not be operated if any of the following conditions exist:
   a. Fuel leaks.
   b. Damage to wiring or electrical conduits causing inoperative lights.
   c. Damage to Prime Mover or semitrailer.
   d. Inoperative primary or parking brake systems.

INITIAL ADJUSTMENTS, CHECKS, AND SELF-TEST - Continued

NOTE

Pressure, vacuum, and fusible vents are installed to meet code requirements and to protect the semitrailer from damage. A plugged or inoperative vent can cause extensive shell damage if design pressure or vacuum is exceeded. The fusible vents are designed to operate at high temperatures. If these vents are coated with paint, dirt, or other foreign material, the temperature, when relief vent opens, may be greatly increased.

2. This is a brief service to make sure that the semitrailer is ready for operation and that conditions affecting the semitrailer's readiness have not changed since the previous after-operation service. The before- operation services, specified in Operation/Crew Preventive Maintenance Checks and Services, must be performed before using the semitrailer.
3. You must follow approved practices and precautions. A detailed understanding of Operation Under Usual Conditions is essential for operating the M900 series semitrailer under unusual conditions.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
COUPLING/UNCOUPLING SEMITRAILER TO PRIME MOVER

INITIAL SETUP:

Personnel Required
Two

COUPLING SEMITRAILER TO PRIME MOVER

WARNING

- If semitrailer is not coupled to Prime Mover, ensure that landing leg is lowered, locked, and wheels are chocked. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- All persons not involved in coupling operation must stand clear of Prime Mover and semitrailer to prevent possible injury. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Do not ram Prime Mover into semitrailer upper coupling (kingpin) plate. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Back Prime Mover slowly to front of semitrailer. Maneuver Prime Mover so kingpin (Figure 1, Item 2) on semitrailer is in line with fifth wheel jaws on Prime Mover.
2. Stop Prime Mover before upper coupler (kingpin) plate (Figure 1, Item 1) of semitrailer starts to ride on fifth wheel of Prime Mover.

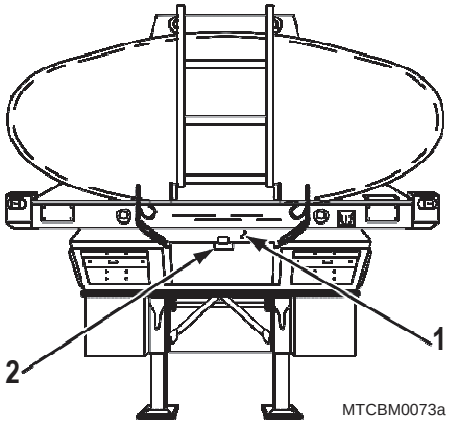


Figure 1. Coupling Semitrailer.

COUPLING SEMITRAILER TO PRIME MOVER - Continued

3. Make sure kingpin (Figure 2, Item 4) and fifth wheel are properly aligned. Landing gear legs (Figure 2, Item 3) may need to be raised or lowered to align the level of upper coupler (kingpin) plate (Figure 2, Item 2) and fifth wheel.
4. Back Prime Mover under upper coupler (kingpin) plate (Figure 2, Item 2) until kingpin (Figure 2, Item 4) and fifth wheel hook automatically. Make sure kingpin (Figure 2, Item 4) and fifth wheel are engaged and locked. Engage Prime Mover parking brake.
5. Remove dummy couplings from semitrailer service coupling (Figure 2, Item 5) and semitrailer emergency air coupling (Figure 2, Item 1). Connect Prime Mover air line marked service to service air coupling (Figure 2, Item 5) and connect air line marked emergency to emergency air coupling (Figure 2, Item 1).

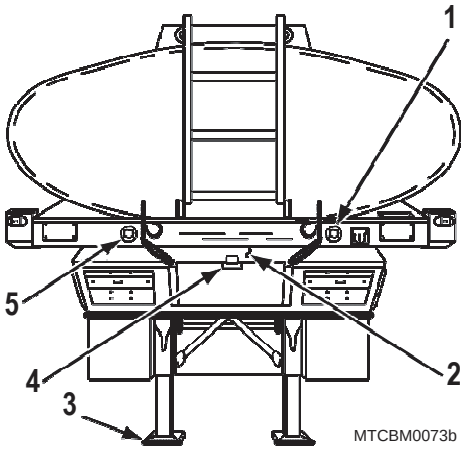


Figure 2. Kingpin.

CAUTION

Proper operation of semitrailer primary brake system is essential for safe operation of vehicle. Functional system check is necessary before putting trailer into service. Semitrailer parking brakes are provided to maintain braking and holding requirements whether semitrailer is fully loaded or empty. The system will automatically apply the parking brakes when air pressure in primary reservoir falls below specified pressure. Proper operation of this system must be maintained. Failure to comply may result in damage to, or destruction of, equipment or mission.

6. Close drain valves (Figure 3, Item 3) on front and rear reservoir tanks (Figure 3, Items 1 and 2).

COUPLING SEMITRAILER TO PRIME MOVER - Continued

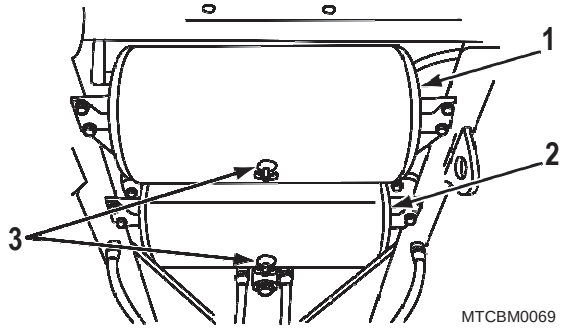


Figure 3. Air Reservoir Tanks.

NOTE

Some of the authorized Prime Movers are not equipped with shut-off valves.

7. Open shut-off valves on air lines of Prime Mover.
8. Plug in intervehicular cable (Figure 4, Item 1) into receptacle (Figure 4, Item 2) on semitrailer.

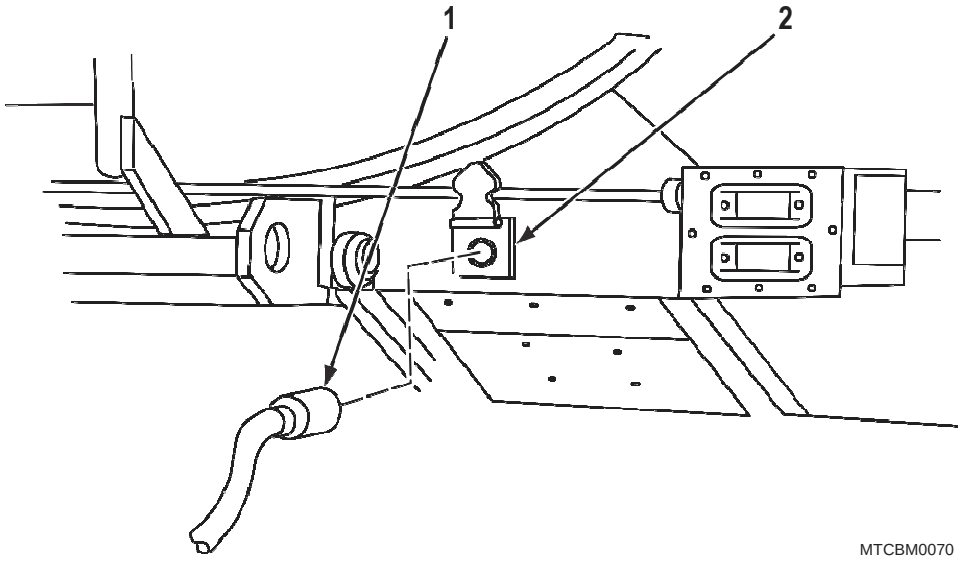


Figure 4. Intervehicular Cable.

COUPLING SEMITRAILER TO PRIME MOVER - Continued

9. With the aid of an assistant, operate lights from Prime Mover to make sure all semitrailer lights are working properly.
10. Release landing gear operating crank (Figure 5, Item 2) from clip (Figure 5, Item 4) and engage crank (Figure 5, Item 2) on shaft (Figure 5, Item 1).

NOTE

- When there is no load, pull out on crankshaft to engage high-speed gears for fast raising or lowering of landing gear legs.
- When greater power is needed, push in on operating shaft to engage low-speed gears to lower or raise landing gear legs.
- Rotate crank clockwise to raise landing gear legs. Rotate crank counterclockwise to lower landing gear legs.

11. Rotate crank (Figure 5, Item 2) and raise landing gear legs (Figure 5, Item 6).
12. Replace crank (Figure 5, Item 2) in clip (Figure 5, Item 4).
13. If ground boards (Figure 5, Item 3) were used, stow them in brackets (Figure 5, Item 5) at each side of semitrailer.

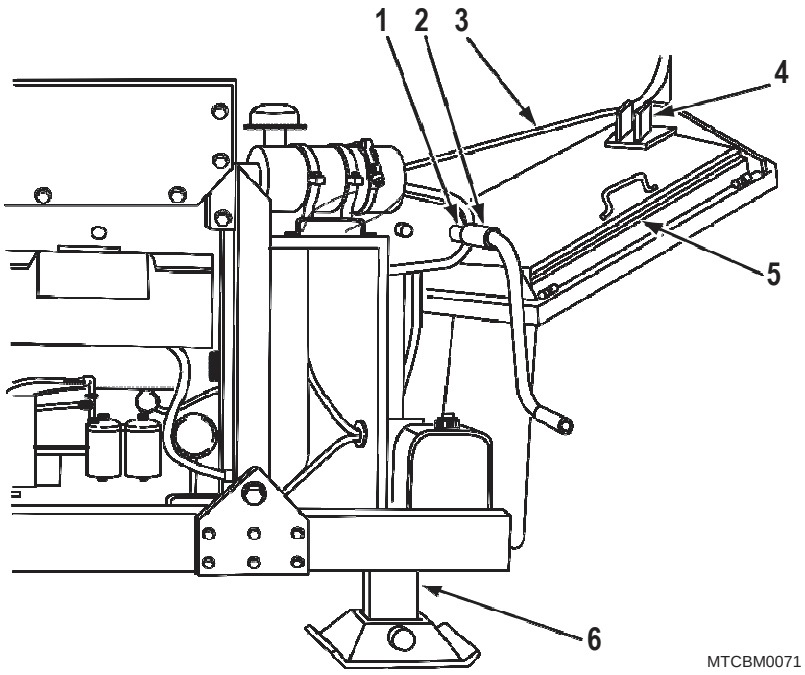


Figure 5. Landing Gear.

END OF TASK

UNCOUPLING SEMITRAILER FROM PRIME MOVER

WARNING

- If semitrailer is not coupled to Prime Mover, ensure that landing leg is lowered, locked, and wheels are chocked. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- All persons not involved in coupling operation must stand clear of Prime Mover and semitrailer to prevent possible injury. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

If the semitrailer is to be uncoupled in mud, sand, or snow or if the Prime Mover is an M931A1, M931A2, M932A1, M932A2, or M1088 begin at Step 1. Otherwise, go to Step 2.

1. Position ground boards (Figure 6, Item 1) beneath landing gear shoes (Figure 6, Item 2).
2. Close shut-off valves on service and emergency air lines at rear of Prime Mover (see operator's manual for Prime Mover).

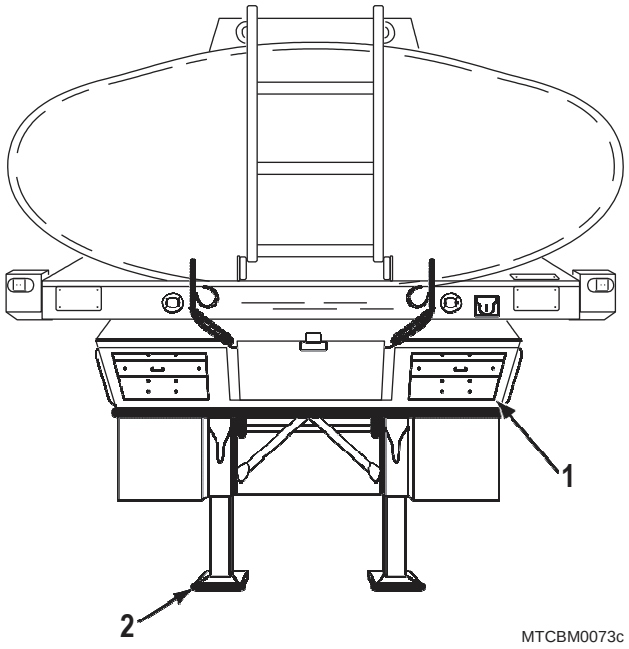


Figure 6. Uncoupling Semitrailer.

UNCOUPLING SEMITRAILER FROM PRIME MOVER - Continued

NOTE

Semitrailer brakes will set automatically when service air brake hose is uncoupled.

3. Disconnect emergency and service air lines from emergency and service air couplings (Figure 7, Items 1 and 3) on semitrailer.
4. Install dummy couplings in semitrailer emergency and service air couplings (Figure 7, Items 1 and 3).
5. Disconnect intervehicular cable from receptacle (Figure 7, Item 2) on semitrailer.

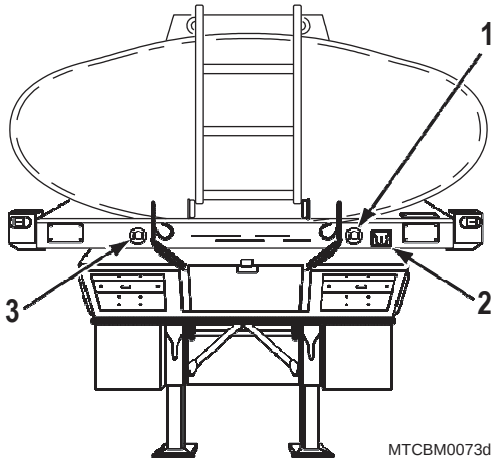


Figure 7. Air Couplings.

WARNING

Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

6. Open drain valves (Figure 8, Item 3) on front and rear reservoirs (Figure 8, Items 1 and 2).

UNCOUPLING SEMITRAILER FROM PRIME MOVER - Continued

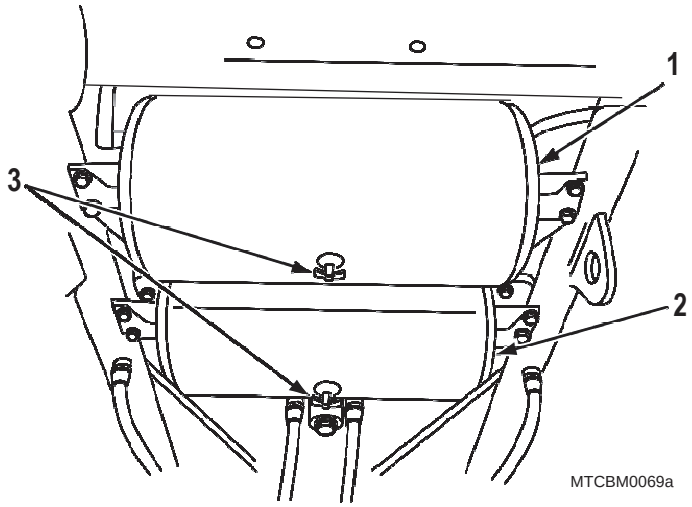


Figure 8. Air Reservoirs.

7. Release landing gear operating crank (Figure 9, Item 2) from clip (Figure 9, Item 3), and engage crank (Figure 9, Item 2) on shaft (Figure 9, Item 1).
8. Rotate crank (Figure 9, Item 2) counterclockwise to lower landing gear (Figure 9, Item 5) until shoes (Figure 9, Item 6) are firmly on the ground or ground boards (Figure 9, Item 4).

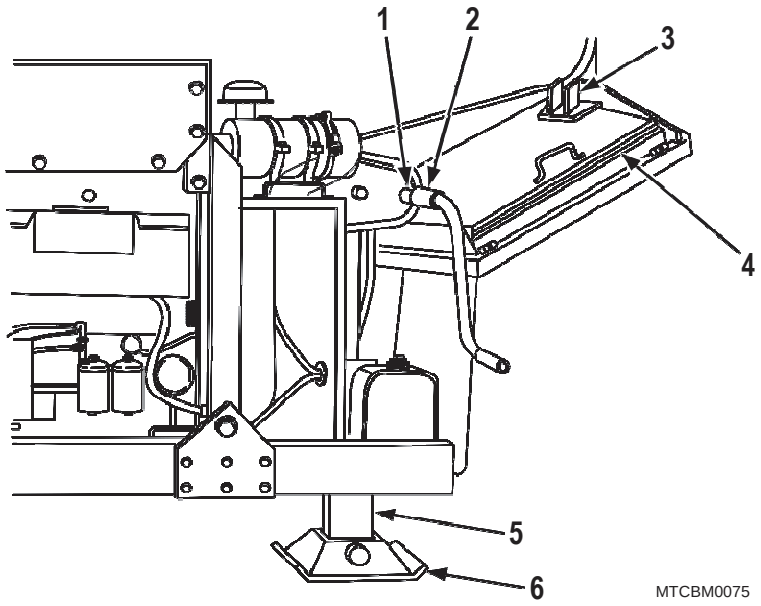


Figure 9. Landing Legs.

UNCOUPLING SEMITRAILER FROM PRIME MOVER - Continued

9. Replace crank (Figure 10, Item 2) in clip (Figure 10, Item 3) and secure.
10. Pull out lockjaw handle to release semitrailer kingpin from Prime Mover's fifth wheel hook. If hook is binding and will not release, pull hook harder to force release.
11. Drive Prime Mover forward until semitrailer is disengaged from Prime Mover and is resting on semitrailer's landing gear (Figure 10, Item 5).

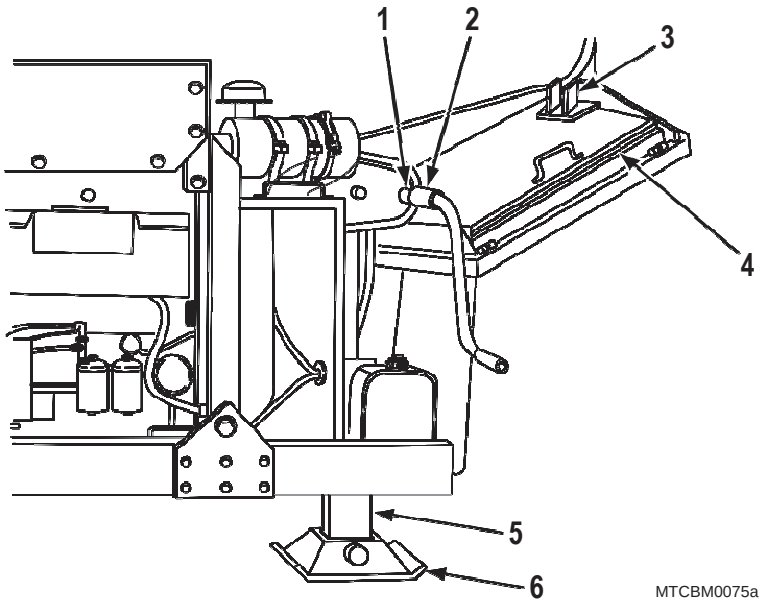


Figure 10. Landing Legs.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
GENERAL FUEL HANDLING INSTRUCTIONS

INITIAL SETUP:

References
FM 10-67-1

SAFETY PRECAUTIONS

WARNING

- Follow all fuel handling procedures precisely, to prevent injury or death to personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Make sure that grounding connections are made properly and firmly before any fueling operations begin so that grounding connections will not release. This will eliminate the possibility of static electricity creating sparks, which will ignite the fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Ladder has narrow tread. Use care when climbing. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

It is important that all fuel handling and operating procedures be followed precisely. A detailed study of FM 10-67-1 is essential for all fuel handling operations.

END OF TASK

BONDING AND GROUNDING

Always connect a static ground cable (Figure 1, Item 1) to the vehicle, storage facility, aircraft, or equipment being serviced. If portable ground is used, make sure a good connection is made. Make sure grounding cables are secured to grounding studs (Figure 1, Item 2).

- Bonding is electrically connecting units or containers to equalize any static potential that might exist before operations begin and to provide a continuous path for any static electricity that might be generated after operations begin.
- Grounding is electrically connecting single or bonded units to a ground rod (Figure 1, Item 3) to discharge into the earth any static potential that might already exist or that might be generated.

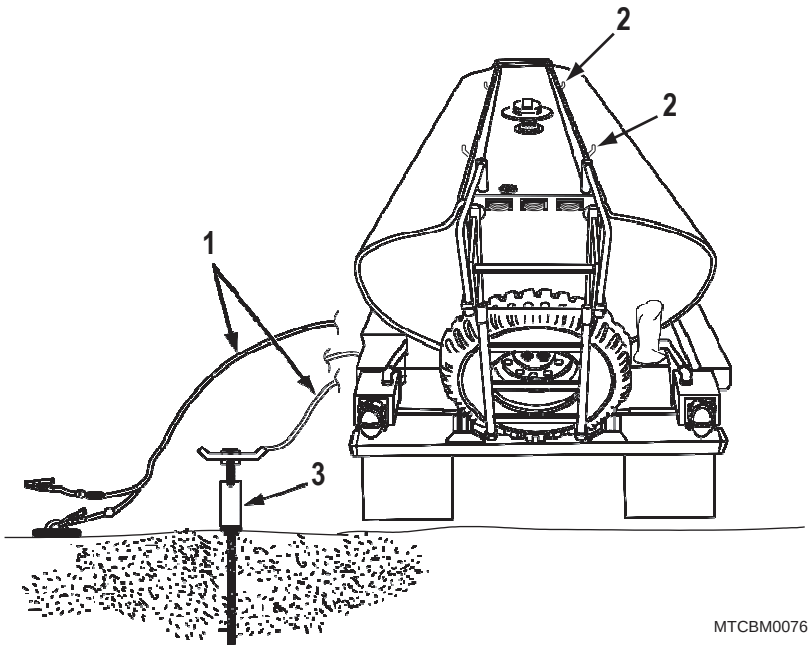


Figure 1. Bonding and Grounding.

- If two or more units are bonded, and one is grounded, the whole system is effectively grounded.
- Follow bonding and grounding procedures presented in specific paragraphs on loading, transferring, and dispensing.
- Before performing maintenance on semitrailer, semitrailer must be grounded to an approved ground (earth).

END OF TASK

BASIC ISSUE ITEMS (BII)

Before each operation, check basic issue items for completeness. If items are missing, vehicle is considered not ready for operation. BII consist of the items in rear of this manual.

END OF TASK

FIRE EXTINGUISHERS

During all fuel handling operations, the fire extinguishers must be removed from their stowage brackets and brought to the point of operation. Replace fire extinguishers and their covers when fuel servicing is complete.

END OF TASK

SPILLS AND LEAKS

WARNING

The operator must be alert for leaking and malfunctioning equipment. Stop all servicing operations immediately at the first sign of leaks or malfunctions. Corrective action must be performed by qualified technicians before resuming any operations. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

All spills must be cleaned up immediately. Suitable containers must be placed under hose connections to collect leakage or spills.

END OF TASK

BULK FUEL SERVICING HOSES

WARNING

Use extreme caution when operating electric rewind on the hose reels. NEVER use the electric rewind on both hose reels at the same time. Electric rewind should be halted, then resumed carefully as the fuel-dispensing nozzle approaches the vehicle. As the hose becomes fully wound on the hose reel, the nozzle may slam against the vehicle with force sufficient to cause injury to personnel and/or damage to equipment. Extreme care is to be used, ensuring that the hose is rewound slowly. Caution should be used at the hose reels to prevent accidental tripping of the rewind switches. If these are accidentally depressed by hand or by falling objects, serious injury to personnel and/or damage to equipment may occur. Whenever bulk fuel hose is required, remove the necessary lengths from hose troughs and couple together as required. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Whenever bulk fuel hose is required, remove the necessary lengths from hose troughs and couple together as required.

END OF TASK

NOZZLES

Make sure hoses are installed with correct fuel dispensing nozzles for the operation intended.

END OF TASK

EMERGENCY VALVE OPERATION

The emergency valve (Figure 2, Item 1) controls the tank outlet. The emergency valve and its vapor vent (Figure 2, Item 2) are mechanically operated by the emergency valve A control handle (Figure 2, Item 3) in the piping control assembly. Engaging the emergency valve A control handle opens the emergency valve to permit fuel flow to/from tank sump. At the same time, vapor vent at top of tank opens to relieve pressure/vacuum during loading and unloading.

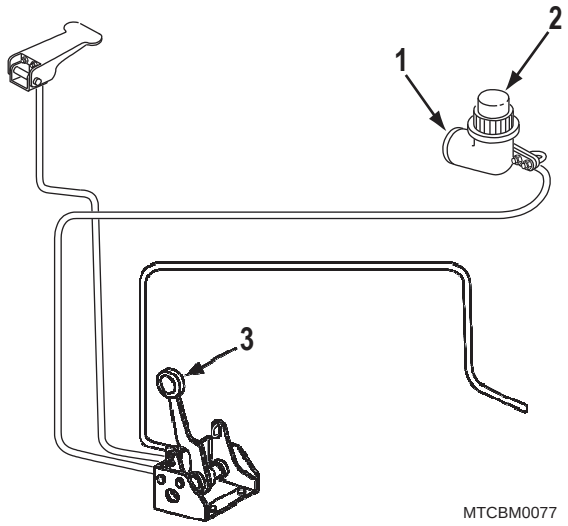


Figure 2. Emergency Valve.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
ENGINE OPERATING INSTRUCTIONS

INITIAL SETUP:

Materials/Parts
Fuel Oil, Diesel, Arctic
(WP 0293, Table 1, Item 8)
Fuel Oil, Diesel
(WP 0293, Table 1, Item 10)

References
WP 0195
WP 0286

BEFORE OPERATION

NOTE

- Unless otherwise noted, Onan and Lombardini engines operate in the same manner. Onan is shown.
- Before starting engine the following checks and services should be performed.

1. Remove fuel tank cap (Figure 1, Item 4) and check fuel supply.
   a. For Onan engines, pull oil dipstick (Figure 1, Item 1) and check oil level. If oil dipstick (Figure 1, Item 1) reads L (low), add one quart to bring oil to F (full) mark. If below L mark, add one quart at a time until dipstick reads F. For oil specification refer to (WP 0286).
   b. For Lombardini engines, pull oil dipstick (Figure 1, Item 1) and check oil level. If oil dipstick (Figure 1, Item 1) shows oil near the first hash mark (minimum), add one quart to bring oil to second hash mark (maximum). If below minimum mark, add one quart at a time until dipstick reaches maximum mark. For oil specification refer to (WP 0286). Continue with next step.
2. Check engine oil.

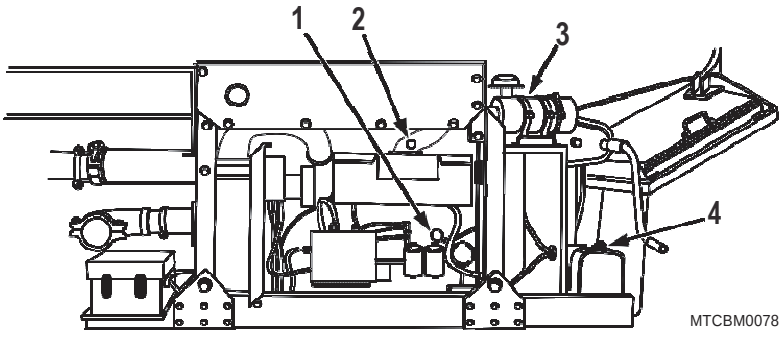


Figure 1. Onan Engine.

3. Check air cleaner restriction indicator window (Figure 1, Item 2). A red band showing indicates that the engine air cleaner (Figure 1, Item 3) is dirty. Clean or replace the air cleaner element (WP 0195).

END OF TASK

STARTING ENGINE

WARNING

- Carbon monoxide can be deadly. DO NOT operate engine in an enclosed area unless it is adequately ventilated. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Hearing protection required within 40 ft (12.19 m) of tanker during the operation of the engine. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

This procedure is for starting a cold engine in temperatures above 55°F (13°C).

1. Set engine switch (Figure 2, Item 4) on control panel (Figure 2, Item 2) to RUN.

NOTE

When engine is warm or restarted after short periods of time, preheating is usually not necessary. In temperatures below 30°F (-1°C), a longer preheating period is needed.

2. Set preheater switch (Figure 2, Item 5) to ON for about 1 minute. Make sure indicator light (Figure 2, Item 6) is illuminated.
3. After 1 minute, turn on starter switch (Figure 2, Item 1) and preheater switch (Figure 2, Item 5).

NOTE

Lombardini engine only: Run engine at fast idle (1200 RPM) approximately 5 minutes after starting engine.

4. After engine starts, release starter switch (Figure 2, Item 1) and preheater switch (Figure 2, Item 5).
5. Check the gages on control panel (Figure 2, Item 2) for correct indications. Stop engine if a system malfunction is indicated.

END OF TASK

STOPPING ENGINE

1. Run engine at fast idle (1200 RPM) for about 5 minutes before stopping to allow for gradual cooling of engine.
2. Release throttle (Figure 2, Item 3) to low idle.
3. Set engine switch (Figure 2, Item 4) to STOP.

STOPPING ENGINE - Continued

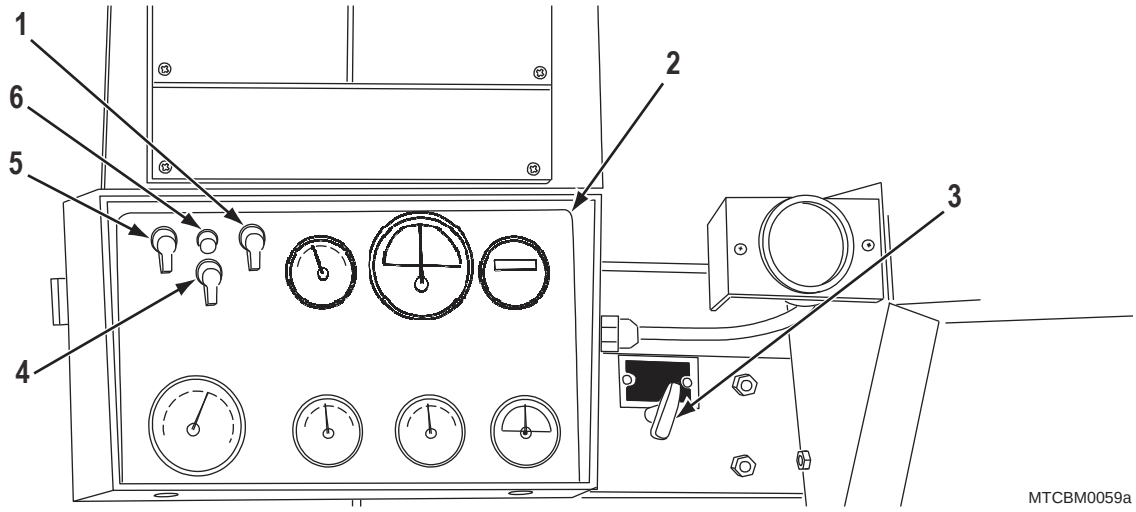


Figure 2. Control Panel Throttle.

END OF TASK

ENGINE OPERATION (HIGH TEMPERATURES)

1. Make sure that nothing obstructs the air flow to and from the engine oil cooler (Figure 3, Item 2) and the cylinder cooling fins (Figure 3, Item 3).
2. Make sure that all shrouds (Figure 3, Item 1) are properly installed and in good condition.

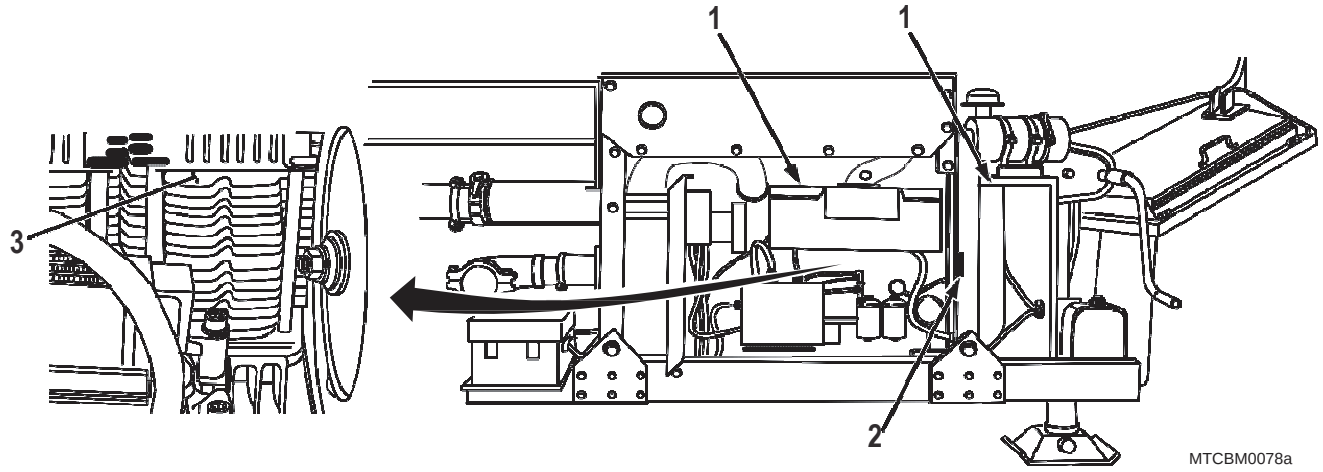


Figure 3. Engine Oil Cooler.

END OF TASK

ENGINE OPERATION (LOW TEMPERATURES)

NOTE

When temperatures are below 30°F (-1 °C), use the following procedure to start the engine. In cold weather operations, cover (dust boot) of fuel stop solenoid must be cut off. Cover stiffens in cold temperatures and stops flow of fuel to engine.

1. Make sure that the engine has the proper oil and fuel for the existing temperatures. Fill with JP8 or arctic diesel fuel for operation below 32°F (0°C). Use JP8 diesel fuel for operation above 32°F (0°C). Tank capacity is approximately four gallons. For oil specifications (WP 0286).
2. Keep batteries (Figure 4, Item 1) fully charged.

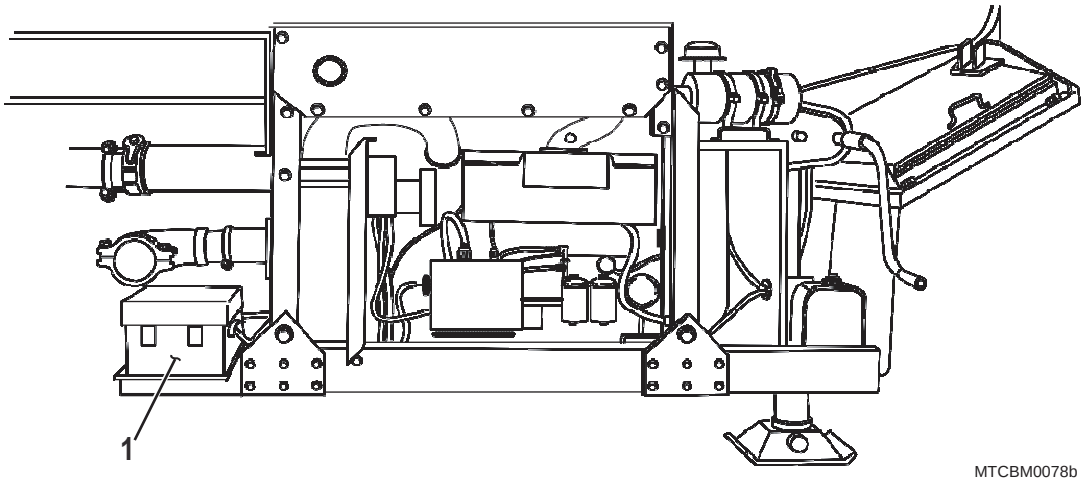


Figure 4. Engine and Batteries.

3. Pull out throttle about half way.
4. Set preheater switch (Figure 5, Item 3) to ON and hold for approximately 2 to 5 minutes.
5. After 2 to 5 minutes, move engine switch (Figure 5, Item 2) to RUN position. Wait 15 seconds, then engage starter switch (Figure 5, Item 1) to START position and crank for 15 seconds. Disengage starter switch (Figure 5, Item 1).

NOTE

DO NOT disengage starter switch at first firing of engine. Continue with switch engaged for a limited time (30 seconds maximum) to help engine run and gain speed.

6. Wait 1 minute and engage starter switch (Figure 5, Item 1). Crank for 1 minute or until running, then disengage starter switch (Figure 5, Item 1).
7. If engine still has not started, engage starter switch (Figure 5, Item 1) and crank for 1 minute. Engine should be firing. Disengage starter switch (Figure 5, Item 1) when engine speed is increasing.
8. Release pre-heater switch (Figure 5, Item 3).

ENGINE OPERATION (LOW TEMPERATURES) - Continued

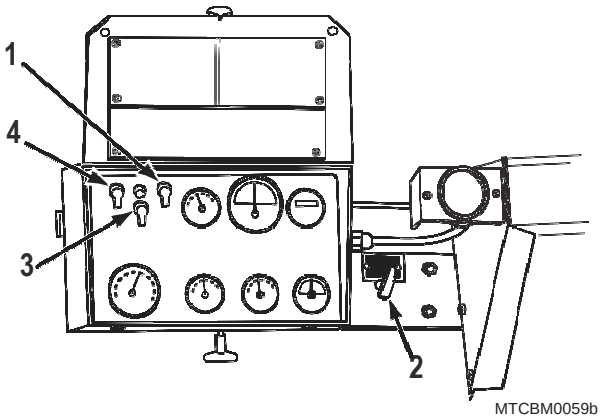


Figure 5. Engine Control Panel (Start Switch).

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
FUEL/DEFUELING, PRECHECK, AND OPERATIONS SUMMARY

INITIAL SETUP:

References
- WP 0011
- WP 0012
- WP 0013

References (cont.)
- WP 0014
- WP 0015
- FM 10-71

WARNING

When filling tank by means of bottom loading, defueling (M970A1) or self-loading, a test of the pre-check system is mandatory. If this system is not functioning, stop all operations. Determine the problem and have it corrected by a qualified technician. Failure of automatic shut-off to function may cause uncontrolled fuel spillage, fire, and/or explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

LOADING PRE CHECK

1. Shortly after fuel flow has begun, open precheck valve D (Figure 1, Item 3) to precheck automatic shut-off (Figure 1, Item 2). Opening precheck valve D (Figure 1, Item 3) sends fuel to float valve (Figure 1, Item 1) inside tank to simulate full tank condition.
2. If shut-off float is functional, flow should stop after about 20-25 seconds.
3. Close precheck valve D (Figure 1, Item 3). Flow will resume in about 20 seconds.
4. During normal loading through bottom of tank, the shut-off (Figure 1, Item 2) system will stop the incoming flow automatically when fuel reaches the level of the float valve (Figure 1, Item 1).

END OF TASK

LOAD/UNLOAD SELECTOR (M967A1, M969A1, AND M969A2)

Before opening any valves for a fuel servicing operation, ensure that the load/unload selector valve E (Figure 1, Item 4) handles are in proper position for fuel servicing operation.

a. Load Position. When selector valve E (Figure 1, Item 4) is in load position, it shuts off pilot pressure to the 4 in. (10.16 cm) control valve (Figure 1, Item 1) for bottom loading operation.

b. Unload Position. When selector valve E (Figure 1, Item 4) is in unload position, it shuts off pilot pressure to the 4 in. (10.16 cm) control valve (Figure 1, Item 1). With pilot pressure shut off, the 4 in. (10.16 cm) control valve (Figure 1, Item 1) closes, eliminating flow through the control valve during bulk delivery and fuel servicing operation.

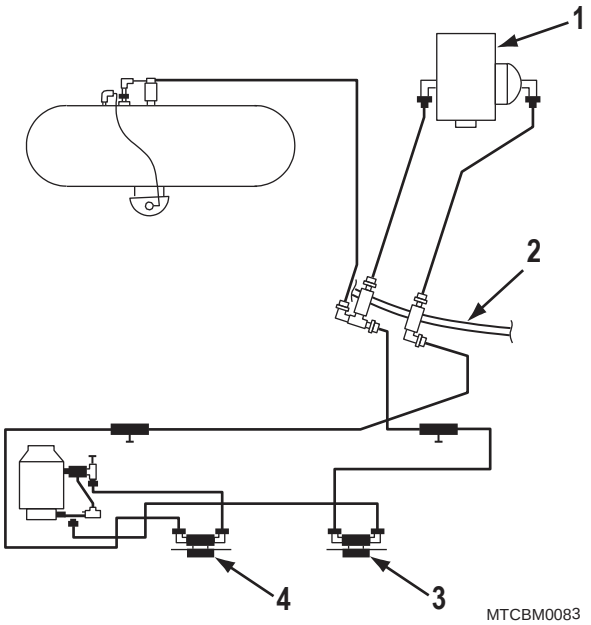


Figure 1. Load/Unload Selector (M967A1, M969A1, and M969A2).

END OF TASK

FUELING/DEFUELING OPERATIONS

WARNING

- All fueling/defueling operations must be performed outside. Failure to follow this warning may cause spark to ignite fuel vapors. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- DO NOT mix incompatible fuels and/or liquids in tank. Dangerous fumes and explosion may result. Know what fuel was previously carried so that preventive measures may be taken to ensure that injurious or explosive fumes are not released. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Changing Fuels. If fuel to be loaded is not the same type of fuel as previously carried, refer to FM 10-67-1, Petroleum Tank Vehicle Operations, for information on purging requirements.

Refer to Table 1, Fueling/Defueling Operations Summary, for a list of paragraphs pertaining to your semitrailer.

Table 1. Fueling/Defueling Operations Summary.

M967A1	
BULK HAUL AND FUEL SERVICING NOT INVOLVING USE OF ENGINE AND PUMP	
Top Loading	(WP 0011)
Bottom Loading (Non-Filtered)	(WP 0011)
Gravity Unload	(WP 0011)
NON FILTERED FUEL SERVICING INVOLVING USE OF ENGINE AND PUMP	
Self-Load	(WP 0012)
Bulk Delivery	(WP 0012)
M969A1	
BULK HAUL AND FUEL SERVICING NOT INVOLVING USE OF ENGINE AND PUMP	
Top Loading	(WP 0011)
Bottom Loading (Non-Filtered)	(WP 0011)
Gravity Unload	(WP 0011)

FUELING/DEFUELING OPERATIONS - Continued

Table 1. Fueling/Defueling Operations Summary - Continued.

NON-FILTERED FUEL SERVICING INVOLVING USE OF ENGINE AND PUMP	
Self-Load	(WP 0012)
Bulk Delivery	(WP 0012)
Non-Filtered Dispensing	(WP 0012)
FILTERED FUEL SERVICING	
Filtered Bulk Delivery	(WP 0013)
Filtered Fuel Dispensing	(WP 0013)
M969A2	
BULK HAUL AND FUEL SERVICING NOT INVOLVING USE OF ENGINE AND PUMP	
Top Loading	(WP 0011)
Bottom Loading (Non-Filtered)	(WP 0011)
Gravity Unload	(WP 0011)
NON-FILTERED FUEL SERVICING INVOLVING USE OF ENGINE AND PUMP	
Self-Load	(WP 0012)
Bulk Delivery	(WP 0012)
Non-Filtered Dispensing	(WP 0012)
FILTERED FUEL·SERVICING OPERATIONS	
Filtered Bulk Delivery	(WP 0013)
Filtered Fuel Dispensing	(WP 0013)
M970A1	
BULK HAUL AND FUEL SERVICING NOT INVOLVING USE OF ENGINE AND PUMP	
Top Loading	(WP 0011)
Bottom Loading (Non-Filtered)	(WP 0011)
Gravity Unload	(WP 0011)

FUELING/DEFUELING OPERATIONS - Continued

Table 1. Fueling/Defueling Operations Summary - Continued.

NON-FILTERED FUEL SERVICING INVOLVING USE OF ENGINE AND PUMP	
Bulk Delivery	(WP 0012)
FILTERED FUEL SERVICING	
Filtered Self-Load	(WP 0014)
Filtered Bulk Delivery	(WP 0014)
AIRCRAFT FUEL SERVICING	
Fuel Sampling	(WP 0015)
Aircraft Single Point Underwing Fuel Dispensing	(WP 0015)
Aircraft Overwing/Closed-Circuit Fuel Dispensing	(WP 0015)
Defueling with 2-1/2 in. Hose	(WP 0015)
Defueling with 1-1/2 in. Hose	(WP 0015)
Recirculation with 2-1/2 in. Hose	(WP 0015)
Recirculation with 1-1/2 in. Hose	(WP 0015)

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
BASIC BULK HAUL AND FUEL SERVICING OPERATIONS NOT INVOLVING USE OF ENGINE AND PUMP

INITIAL SETUP:

References
WP 0008

TOP LOADING

WARNING

- When top loading through fill cover, there is no automatic shutdown. Man the loading hose to avoid fuel spillage. Use the capacity indicator gage and dipstick gage to determine amount of fuel loaded. Failure to follow this warning may cause uncontrolled fuel spillage, fire and/or explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Ladder has narrow steps. Use care when climbing. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Review General Fuel Handling instructions (WP 0008).
2. Make sure that all valves are closed.
3. Ground the semitrailer tank (WP 0008).

TOP LOADING - Continued

NOTE

When loading with a rack or stand, perform Step 4. When loading with a hose, perform Step 5.

4. Connect the bonding and grounding cable (Figure 1, Item 1) of loading rack or stand to one of the four grounding studs (Figure 1, Item 2) on the top of tank or one of the two on the lower side of the tank before opening fill cover.
5. The loading hose (Figure 1, Item 3) supplied by the storage facility may have a metal fitting on the free end and the hose may not be bonded internally. Such a fitting is insulated and could become charged. Before opening fill cover (Figure 1, Item 8), connect the vehicle bonding and grounding cable (Figure 1, Item 1) to grounding stud (Figure 1, Item 2) on top of tank and to some part of the permanent piping of the storage facility (Figure 1, Item 4).
6. Remove the extinguishers (Figure 1, Item 5) and bring them to the point of operation.

WARNING

- Manhole fill cover does not lock open. Injury may occur if manhole fill cover accidentally closes on personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- To avoid personal injury, ALWAYS relieve pressure in tank shell before opening manhole cover. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

7. Remove padlock (Figure 1, Item 9). Slowly open fill cover (Figure 1, Item 8) in manhole cover (Figure 1, Item 7) and insert hose far enough to keep end of hose in contact with bottom of tank.

NOTE

The capacity indicator gage is located inside the tank near the fill cover.

8. Slowly begin flow and fill tank no further than to the bottom of the capacity indicator gage (Figure 1, Item 6).
9. Remove fill hose (Figure 1, Item 3). Close and secure manhole fill cover (Figure 1, Item 8) with padlock (Figure 1, Item 9).
10. Drain accumulated water.
11. Remove grounding cable (Figure 1, Item 1) from grounding stud (Figure 1, Item 2) on top of tank.
12. Store and cover fire extinguishers (Figure 1, Item 5).

TOP LOADING - Continued

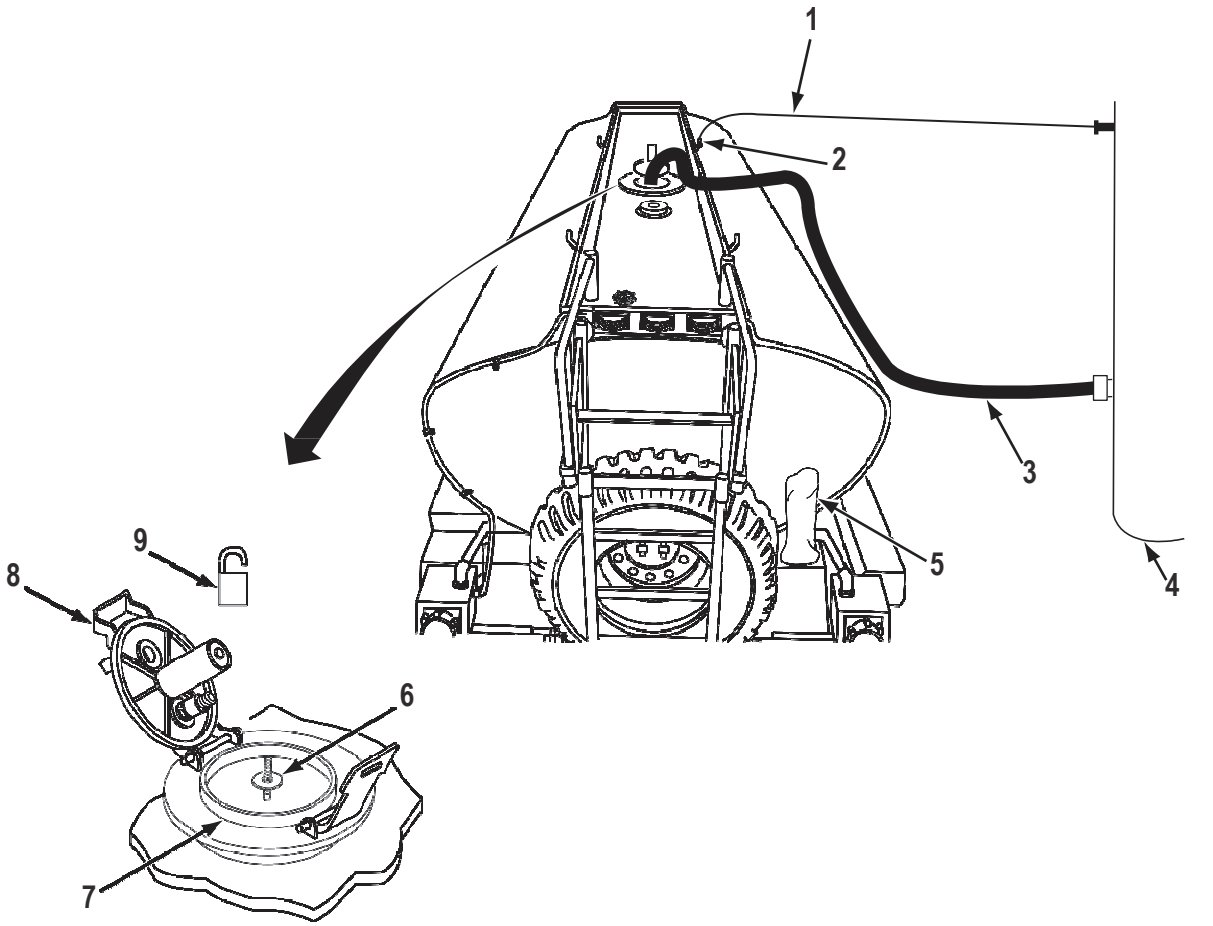


Figure 1. Top Loading Components/Manhole.

END OF TASK

BOTTOM LOADING (NONFILTERED)

1. Review General Fuel Handling Instuctions (WP 0008).
2. Make sure that all valves are closed.
3. Ground semitrailer tank (WP 0008).
4. Connect grounding wire to storage facility and grounding stud on top of semitrailer.
5. Remove fire extinguishers (Figure 1, Item 5) and bring them to the point of operation.

BOTTOM LOADING (NONFILTERED) - Continued

6. Remove cover (Figure 2, Item 1) from bottom loading connection (Figure 2, Item 2). Connect bottom loading hose to bottom loading connection (Figure 2, Item 2).

NOTE

Perform Step 7 for M967A1, M969A1, and M969A2 Semitrailer tankers only.

7. Set function selector valve E (Figure 2, Item 5) in LOAD position.
8. Pull emergency valve A control handle (Figure 2, Item 4) to OPEN position.
9. Begin fuel flow.

WARNING

When filling tank by means of bottom loading, defueling (M970A1) or self-loading, a test of the pre-check system is mandatory. If this system is not functioning, stop all operations. Determine the problem and have it corrected by a qualified technician. Failure of automatic shut-off to function may cause uncontrolled fuel spillage, fire, and/or explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

10. After flow has begun, set loading pre-check valve D (Figure 2, Item 3) to OPEN position to precheck the shut-off float. If float is functional, flow should stop after about 20-25 seconds.
11. Set loading pre-check valve D (Figure 2, Item 3) to CLOSED position. Flow will resume in about 20 seconds.

NOTE

Stop the fuel supply at the loading facility and notify your supervisor if a shut-off float malfunction or defective 4 in. (10.16 cm) control valve stops fuel flowing into the semitrailer, leaks are present, or any other unusual conditions are observed.

12. When tank is full, fuel should stop automatically. Close all valves, replace all covers, and disconnect hose.
13. Drain accumulated water.

BOTTOM LOADING (NONFILTERED) - Continued

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

14. Remove grounding wires.
15. Store and cover fire extinguishers.

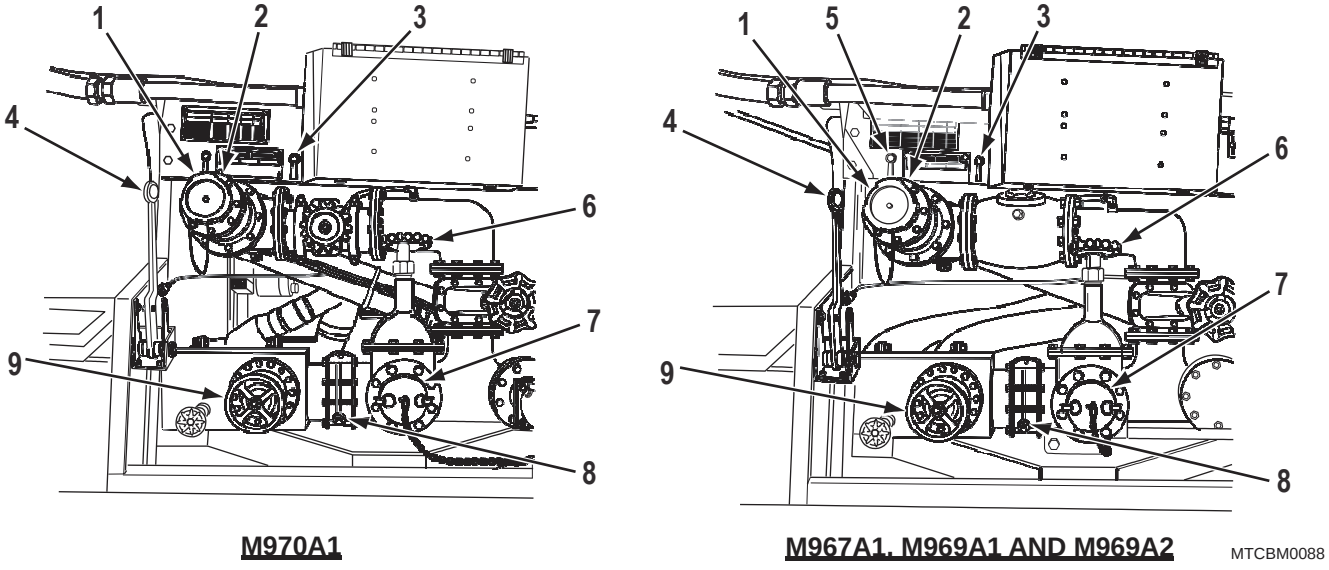


Figure 2. Fuel Servicing Components (Without Pump) Bottom Loading and Gravity Unload Outlet B.

END OF TASK

GRAVITY UNLOAD

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Review General Fuel Handling Instructions (WP 0008).
2. Make sure that all valves are closed.
3. Connect grounding wire to storage facility and grounding stud on top of semitrailer.
4. Disconnect spring pins and turn hose trough bars out of the way to remove 4 in. (10.16 cm) bulk delivery hose(s) from trough.
5. Remove dust cover from outlet B (Figure 3, Item 7) and connect hose to outlet B (Figure 3, Item 7) and to storage facility.
6. Remove fire extinguishers and bring to point of operation.
7. Make sure valve E (Figure 3, Item 5) (M967A1, M969A1, and M969A2) is in UNLOAD position.
8. Pull emergency valve A control handle (Figure 3, Item 4) to OPEN position and open valves B, G, and H (Figure 3, Items 6, 8, and 9) to begin flow.
9. At end of operation, close all valves. Evacuate the hose. Disconnect the hose and put it in hose trough. Secure hose trough latches. Install dust cover on valve B (Figure 3, Item 6).
10. Drain accumulated water.

WARNING

When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

11. Remove grounding wires.
12. Store and cover fire extinguishers.

END OF TASK

WATER DRAIN

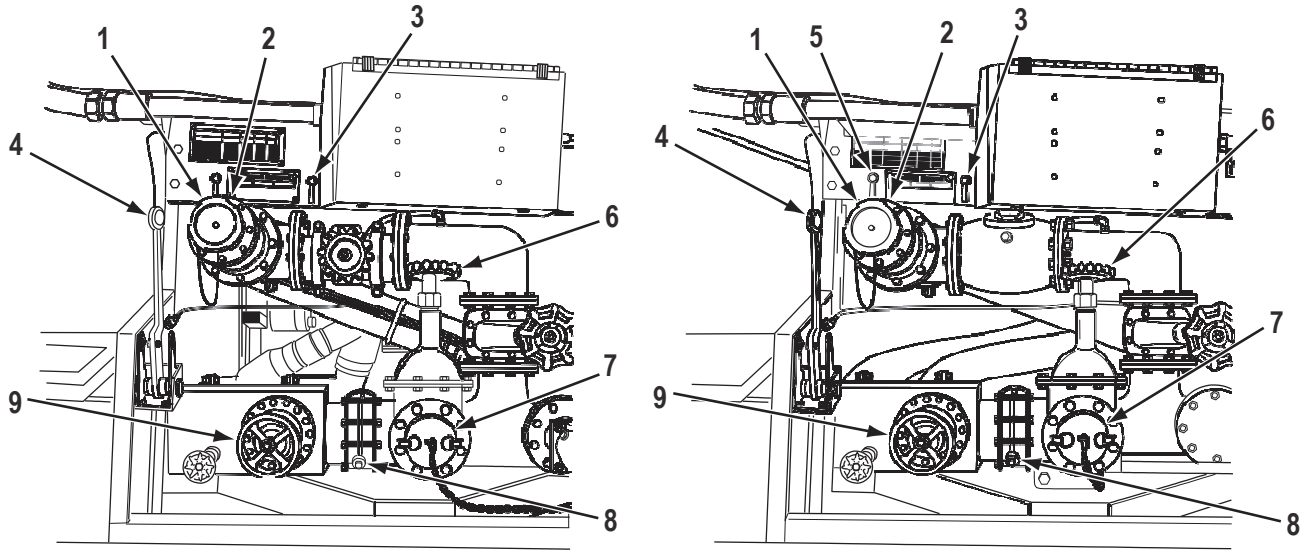
CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Accumulated water should be drained from the system after each period of operation.

1. Make sure that all valves are closed.
2. Put a suitable container under drain in manifold in piping control cabinet. Pull emergency valve A control handle (Figure 3, Item 4) to OPEN position. Slowly open valves H and J (Figure 3, Items 8 and 9). Allow to drain until pure fuel begins to flow. Close valves H and J (Figure 3, Items 8 and 9) and set emergency valve A control handle (Figure 3, Item 4) to CLOSED position.



M970A1 **M967A1, M969A1 AND M969A2**

MTCBM0088a

Figure 3. Draining Fuel Servicing Components (Without Pump) Bottom Loading and Gravity Unload Outlet B.

WATER DRAIN - Continued

3. Drain the pilot lines on all models. Open drain valves as indicated in figures below. Drain valves (Figure 4, Item 9) are located behind the piping control assembly near the 4 in. (10.16 cm) control valve (Figure 4, Item 1). Drain valves (Figure 4, Item 2) are located beneath the tank, fastened to the emergency valve discharge tube (Figure 4, Item 3). Drain valves (Figure 4, Item 5) are only on the M970A1 model. Drain valves (Figure 4, Item 5) are located behind the hose reel cabinet near the 3 in. (7.6 cm) control valve (deadman) (Figure 4, Item 4). Allow to drain until fuel begins to flow. Close drain valves.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

4. On models M969A1, M969A2, and M970A1, also drain the filter/separator (Figure 4, Item 6). Open valve M (Figure 4, Item 8). Put a suitable container under valve N (Figure 4, Item 7) on bottom of filter/separator. Slowly open valve N (Figure 4, Item 7). Allow to drain until fuel flow begins. Close valves N and M (Figure 4, Items 7 and 8).

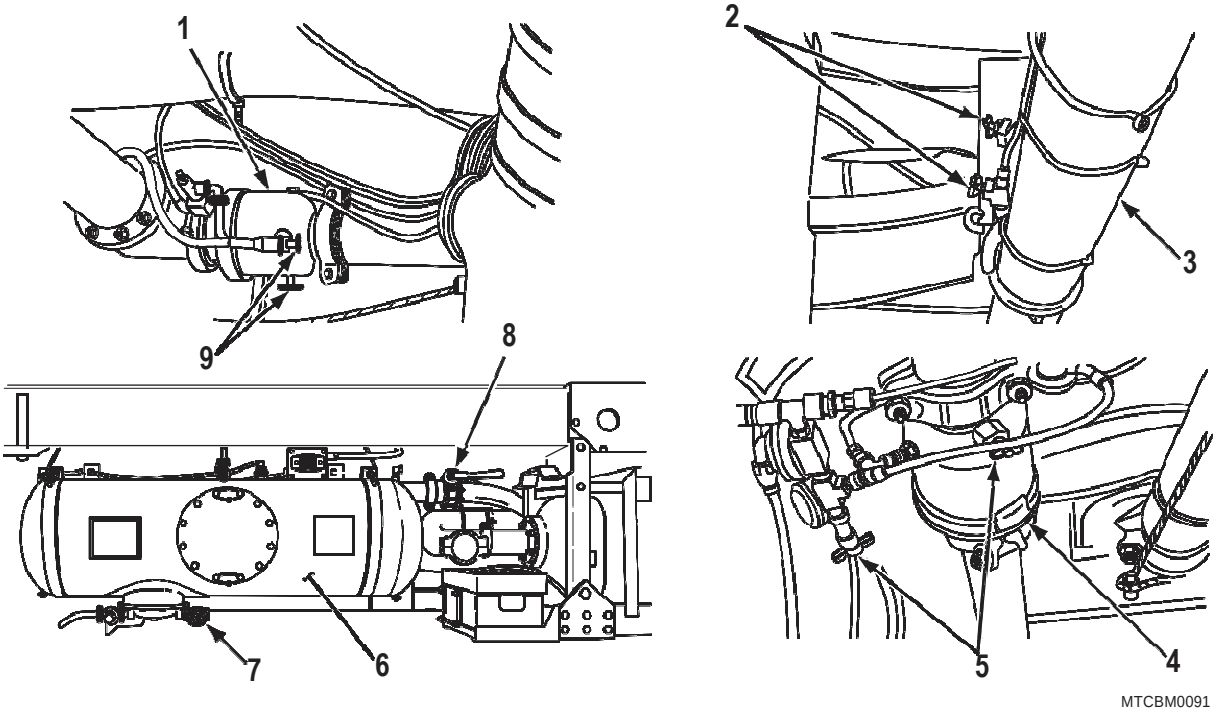


Figure 4. Filter Separator.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
NONFILTERED FUEL SERVICING INVOLVING USE OF ENGINE AND PUMP

INITIAL SETUP:

References
WP 0008
WP 0009

SELF-LOAD

NOTE

Use the following procedure when it is necessary to use the onboard engine and pump to load fuel from the storage facility to the semitrailer.

1. Review General Fuel Handling Instructions (WP 0008).
2. Make sure that all valves are closed.
3. Connect static reel grounding wire (Figure 1, Item 1) to storage facility. Remove fire extinguishers and bring to point of operation.
4. Start engine (WP 0009). When engine is warm, adjust idle speed to 1000-1200 RPM.
5. Disconnect spring pins and turn hose trough bars out of the way to remove 4 in. (10.16 cm) bulk fuel hose from hose trough.

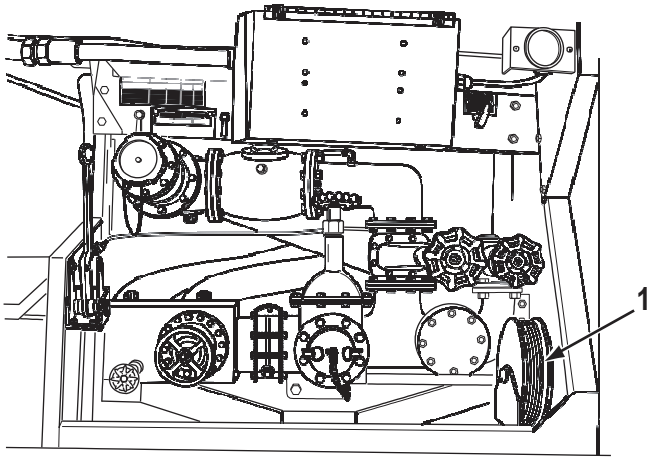


Figure 1. Static Reel Grounding Wire Connection.

SELF-LOAD - Continued

Table 1. Fuel Dispensing Flow Rates in Gallons Per Minute (GPM).

M967A1 - BULK										
SELF-LOAD							BULK DELIVERY			
ENGINE RPM		2200		2400			2200		2400	
PUMP GPM		290		320			480		530	
M969A1 and M969A2 - AUTOMOTIVE										
SELF-LOAD			DISPENSING				BULK DELIVERY			
			FILTERED		NONFILTERED		FILTERED		NONFILTERED	
ENGINE RPM	2200	2400	1200	2400	2200	2400	2200	2400		
PUMP GPM	290	320	44	88	44	88	175	190	480	530
M970A1 - AIRCRAFT UNDERWING/OVERWING										
SELF-LOAD FILTERED			OVERWING REFUELING		UNDERWING REFUELING		DEFUEL FILTERED			
ENGINE RPM	2200	2400	2200	2400	2200	2400	2200	2400		
PUMP GPM	290	240	90	100	220	240	50	60		

6. Remove dust cover from outlet B (Figure 2, Item 3) and connect bulk fuel hose to outlet and storage facility.
7. Put valve E (Figure 2, Item 1) in LOAD position.
8. Open valve operator A (Figure 2, Item 6) and valves B and G (Figure 2, Items 3 and 5).
9. Adjust engine throttle for desired flow rate (Table 1).

WARNING

When filling tank by means of bottom loading, defueling (M970A1) or self-loading, a test of the pre-check system is mandatory. If this system is not functioning, stop all operations. Determine the problem and have it corrected by a qualified technician. Failure of automatic shut-off to function may cause uncontrolled fuel spillage, fire, and/or explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

SELF-LOAD - Continued

10. Shortly after flow has started, open valve D (Figure 2, Item 2) to precheck shut-off float. If float is functional, flow should stop after about 20-25 seconds.
11. Close valve D (Figure 2, Item 2). Flow will resume in about 20 seconds.

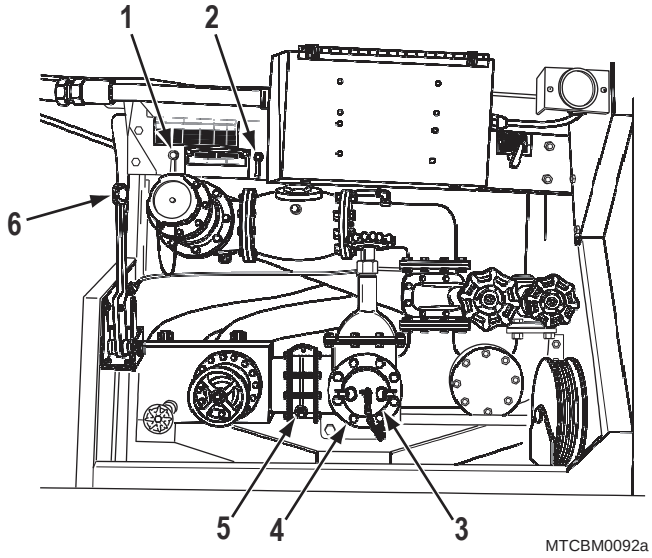


Figure 2. Valve D.

WARNING

In an emergency, close valve A or pull emergency valve shut-off on opposite side of semitrailer to manually stop the fuel flow. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

12. When tank is full, flow should stop automatically.
13. At end of operation, idle down engine.
14. Close all valves.
15. Evacuate the hose. Disconnect 4 in. (10.16 cm) bulk fuel hose(s) and place in hose trough.
16. Secure hose trough latches.
17. Stop engine (WP 0009).
18. Drain accumulated water.

SELF-LOAD - Continued

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

19. Remove grounding wires.
20. Store and cover fire extinguishers.

END OF TASK

BULK DELIVERY

NOTE

Use the following procedure to pump fuel from the semitrailer to the storage facility.

1. Review General Fuel Handling Instructions (WP 0008).
2. Make sure that all valves are closed.
3. Connect the static reel grounding wire (Figure 3, Item 4) to storage facility. Remove fire extinguishers and bring them to the point of operation.
4. Start engine (WP 0009). When engine is warm, adjust the throttle idle speed to 1000-1200 RPM.
5. Disconnect spring pins and turn hose trough bars out of the way to remove 4 in. (10.16 cm) bulk fuel hose from trough.
6. Remove dust cover from outlet S (Figure 3, Item 6) and connect bulk fuel hose to outlet and storage facility.
7. Put valve E (Figure 3, Item 2) in UNLOAD position (M967A1, M969A1, and M969A2) or in CLOSED position (M970A1).
8. Put emergency valve A control handle (Figure 3, Item 1) in OPEN position and open valves B, F, and H (Figure 3, Items 3, 5, and 7).

BULK DELIVERY - Continued

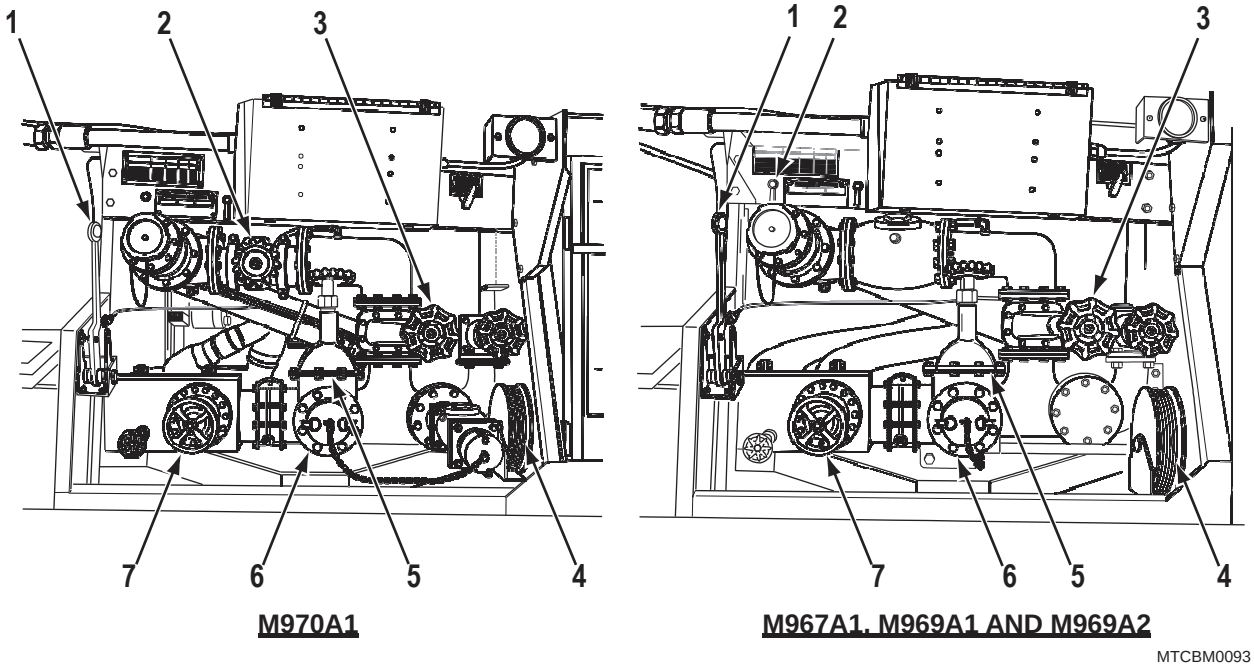


Figure 3. Fuel Servicing Components.

9. Adjust engine throttle for desired flow rate (Table 1).
10. Idle down engine at end of operation. Close all valves, evacuate the hose, disconnect hose(s), and reinstall dust cover.
11. Put bulk fuel hoses in hose trough and secure latches.
12. Stop engine (WP 0009).
13. Drain accumulated water.

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

14. Remove grounding wires.
15. Store and cover fire extinguishers.

END OF TASK

NONFILTERED DISPENSING (M969A1, M969A2, and M970A1)

NOTE

Use the following procedure for fuel, which does not require filtering and is routed directly from the pump to the hose reels, bypassing the filter/separator.

1. Review General Fuel Handling Instructions (WP 0008).
2. Make sure that all valves are closed.

NOTE

If two vehicles are being serviced, make sure they are both grounded using separate static reels, M969A1 and M969A2 models are equipped with two static reels.

3. Unreel static reel cable (Figure 4, Item 11) and connect it to a suitable ground and to automotive unit/container.
4. Remove fire extinguishers and bring them to the point of operation.
5. Start engine (WP 0009). When engine is warm, adjust throttle idle speed to 1000-1200 RPM.
6. Put valve E (Figure 4, Item 1) in UNLOAD position.
7. Put emergency valve control handle A (Figure 4, Item 14) in OPEN position and open valves F, H, and K (Figure 4, Items 12, 13, and 2).

NOTE

Valves P and R may be opened at the same time if two vehicles are being serviced. Make sure both vehicles are grounded.

8. Reset meter (Figure 4, Item 5) to zero by pushing reset knob and turning clockwise.
9. Open valve P (Figure 4, Item 10) if front hose reel (Figure 4, Item 4) is being used, or open valve R (Figure 4, Item 6) if rear hose reel (Figure 4, Item 9) is being used.
10. Adjust engine throttle for desired flow rate (Table 1).
11. Release lock on hose reel (Figure 4, Item 7) and unwind hose.
12. Insert nozzle (Figure 4, Items 3 or 8) in vehicle fuel tank/container. Squeeze nozzle trigger to start flow.
13. At end of operation, release nozzle trigger and remove nozzle from vehicle fuel tank/container.
14. Idle down engine to 1000-1200 RPM.

CAUTION

DO NOT rewind hose reels simultaneously. Rewind hoses while engine is running to avoid discharging battery. Failure to comply may result in damage to, or destruction of, equipment or mission.

15. Rewind hose(s) and tighten hose reel lock(s) (Figure 4, Item 7).
16. Close all valves. Evacuate the hose.
17. Stop engine (WP 0009).

NONFILTERED DISPENSING (M969A1, M969A2, and M970A1) - Continued

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

18. Disconnect and rewind static reel cable (Figure 4, Item 11).
19. Store and cover fire extinguisher.

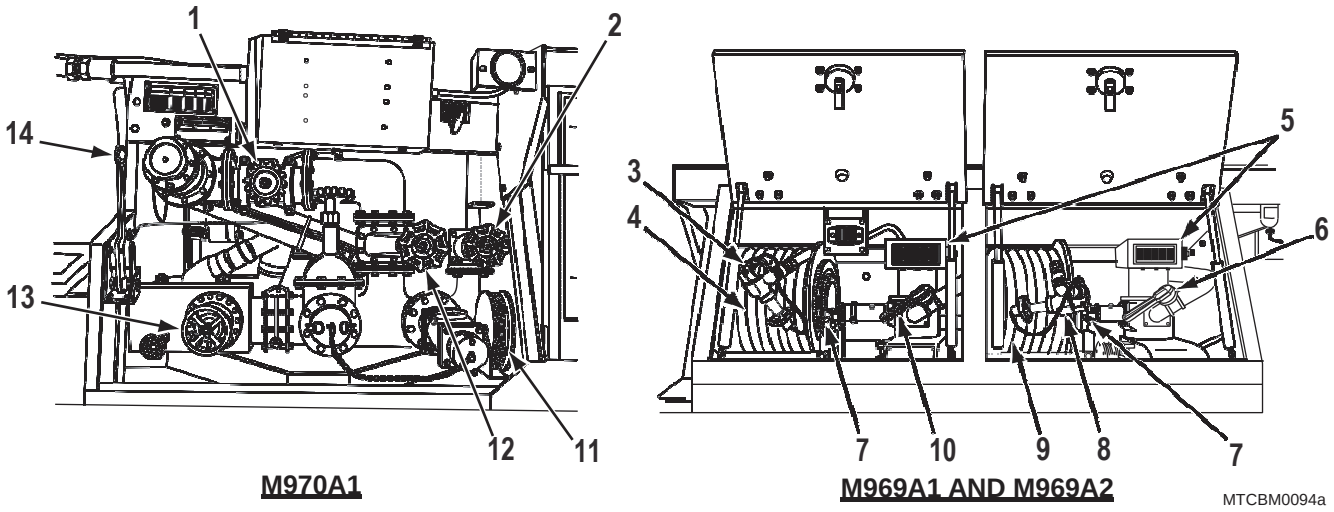


Figure 4. Pump and Hoses.

END OF TASK

HOSE EVACUATION (M970A1)

NOTE

Use the following procedure to purge or remove fuel from the dispensing system. This procedure must be done after every operation using the dispensing hoses.

1. Review General Fuel Handling Instructions (WP 0008).

NOTE

All fuel dispensing operations begin and end with all valves closed.

2. Make sure that all valves are closed.
3. Remove fire extinguishers and bring to point of operation.
4. Start engine (WP 0009). When engine is warm, adjust idle speed to 1000-1200 RPM.

HOSE EVACUATION (M970A1) - Continued

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

5. Place nozzle over suitable container and open valve operator A (Figure 5, Item 1) and valves E, G, and K (Figure 5, Items 2, 3, and 4). Open valve P (Figure 5, Item 6) to evacuate the 1-1/2 in. (4.06 cm) hose (Figure 5, Item 5) and/or valve R (Figure 65, Item 7) to evacuate the 2-1/2 in. (6.6 cm) hose (Figure 6, Item 8).

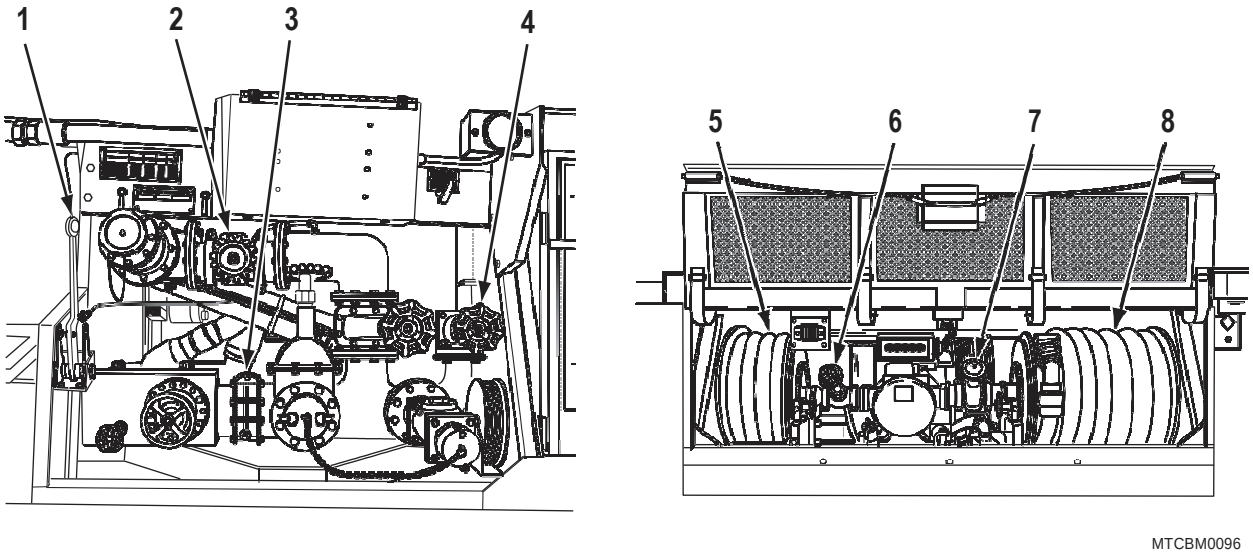


Figure 5. Fuel Pump Assembly.

6. Set engine throttle to maximum speed 2400 RPM for a few seconds until evacuation is completed (meter stops turning backward).
7. Idle down engine to 1000-1200 RPM.
8. Close all valves.
9. Stop engine (WP 0009).
10. Store and cover fire extinguishers.
11. Close hose reel cabinet doors.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
FILTERED FUEL SERVICING OPERATIONS (M969A1 AND M969A2)

INITIAL SETUP:

References
FM 10-67-1
WP 0008
WP 0009

References (cont.)
WP 0012
WP 0015

FILTERED BULK DELIVERY

NOTE

Use this procedure when filtered fuel is required in the storage facility. Fuel is pumped from the semitrailer tank through the filter/separator to the storage facility.

1. Review General Fuel Handling Instructions (WP 0008).
2. Operation begins and ends with all valves closed.
3. Connect grounding wire (Figure 1, Item 1) to storage facility and semitrailer.
4. Remove 4 in. (101.6 mm) bulk fuel hose from hose trough and connect it to the receiving facility.
5. Remove dust cap from outlet B (Figure 1, Item 2) and connect bulk fuel hose to outlet.
6. Remove fire extinguishers and bring them to the point of operation.
7. Start engine (WP 0009) and when warm, adjust engine speed (1000-1200 RPM).

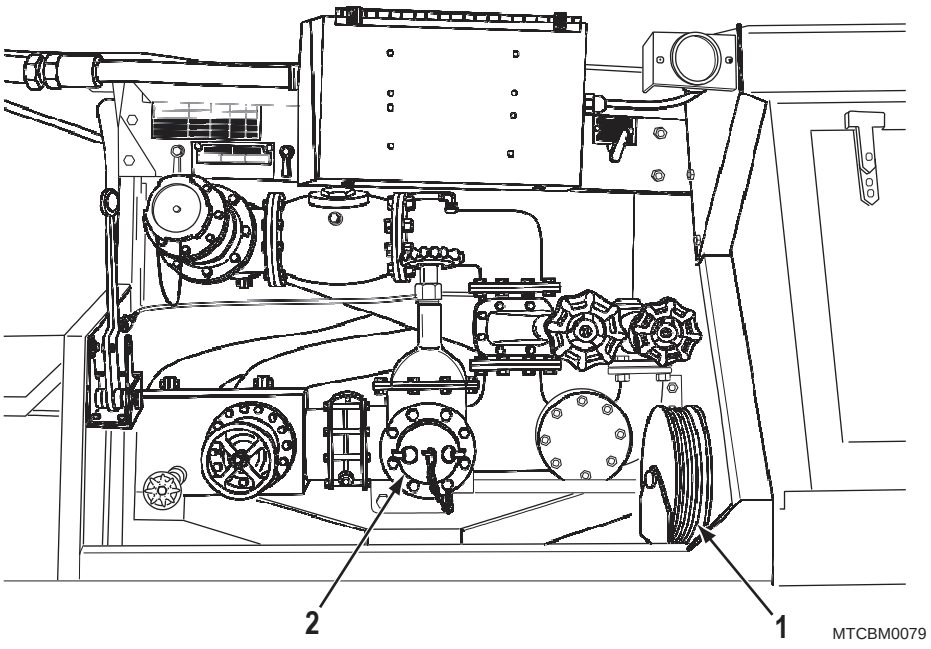


Figure 1. Filtered Fuel Servicing Components.

FILTERED BULK DELIVERY - Continued

8. Put selector valve E (Figure 2, Item 1) in UNLOAD position.
9. Pull emergency valve A control handle (Figure 2, Item 8) to OPEN position and open valves K, B, H, and M (Figure 2, Items 3, 2, 7, and 4).
10. Adjust engine throttle for desired flow rate (WP 0009).
11. At end of operation, adjust engine to idle speed ((1000-1200 RPM)).
12. Close all valves. Evacuate the hose.
13. Remove all hoses and store in hose troughs. Secure hose trough latches. Install dust cap on outlet B (Figure 2, Item 6).
14. Shut off engine (WP 0009).

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

15. Remove grounding wire (Figure 2, Item 5).
16. Cover and store fire extinguishers.

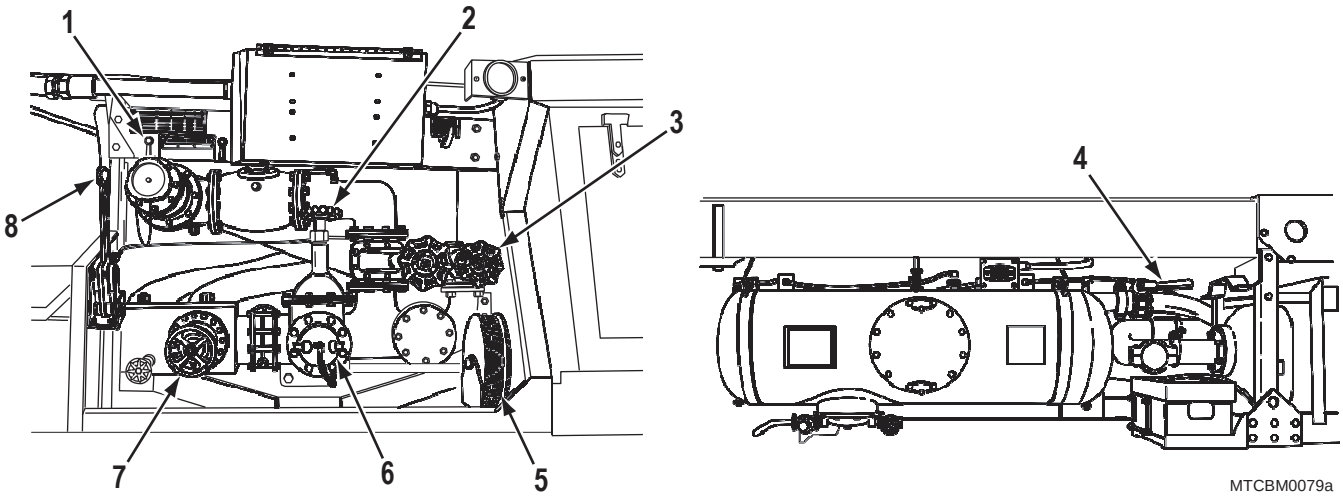


Figure 2. Filtered Bulk Delivery.

END OF TASK

FILTERED FUEL DISPENSING

NOTE

Use this procedure to dispense metered fuel from the semitrailer tank to a vehicle. Fuel is pumped from the semitrailer tank through the filter/separator, a meter, and a hose reel to the vehicle.

1. Review General Fuel Handling Instructions (WP 0008).
2. Operation begins and ends with all valves closed.
3. Connect static reel grounding wire (Figure 3, Item 4) to vehicle.
4. Remove fire extinguishers and bring to point of operation.
5. Start engine (WP 0009). When engine is warm, adjust engine idle speed to (1000-1200 RPM).
6. Put selector valve E (Figure 2, Item 7) in the UNLOAD position.
7. Pull emergency valve A control handle (Figure 2, Item 6) in OPEN position, and open valves H (Figure 2, Item 5), M (Figure 2, Item 3), and either P (Figure 3, Item 7) or R (Figure 3, Item 3), depending on which hose reel is to be used. If both hose reels are to be used, open both valves P (Figure 3, Item 7) and R (Figure 3, Item 3).
8. Reset meter (Figure 3, Item 1) to zero by pushing in the meter reset knob (Figure 3, Item 2) and turning clockwise.
9. Adjust engine throttle for desired flow rate (WP 0012).
10. Release lock (Figure 3, Item 5) on hose reel(s) to be used. Unwind hose(s) completely.
11. Insert nozzle (Figure 3, Item 6 or 8) into vehicle being serviced and squeeze nozzle trigger to start flow.
12. Release nozzle trigger at end of operation and remove nozzle (Figure 3, Item 6 or 8) from vehicle.

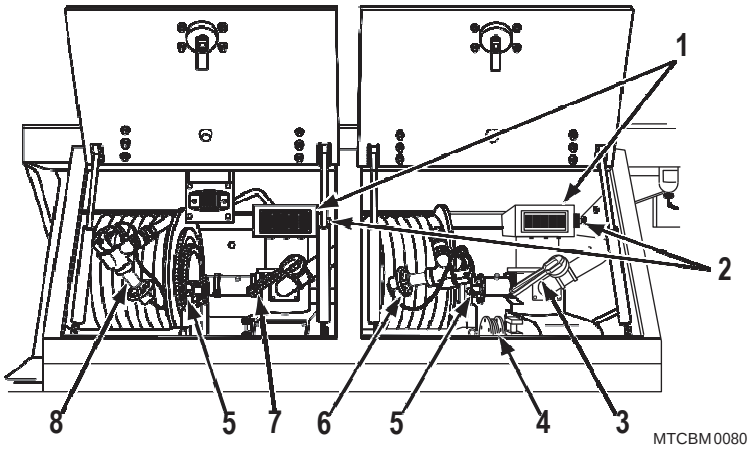


Figure 3. Filtered Fuel Dispensing.

13. Adjust engine to idle speed (1000-1200 RPM).

FILTERED FUEL DISPENSING - Continued

CAUTION

DO NOT rewind hose reels simultaneously. Rewind hoses while engine is running to avoid discharging battery. Failure to comply may result in damage to, or destruction of, equipment or mission.

14. Rewind hose(s). Tighten hose reel lock.
15. Close all valves.
16. Shut off engine (WP 0009).

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

17. Disconnect static reel cable (Figure 4, Item 1) from vehicle. Rewind static reel cable (Figure 4, Item 1).
18. Cover and store fire extinguisher(s).
19. Close hose reel cabinet doors.

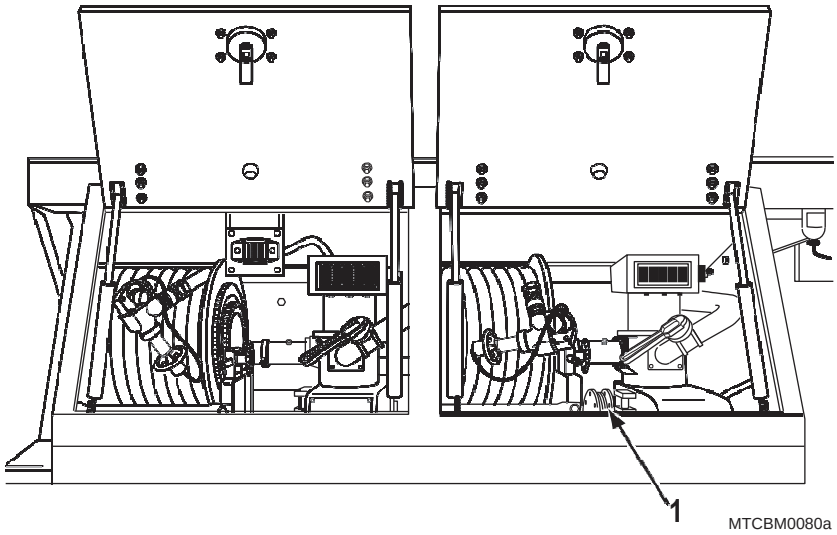


Figure 4. Static Reel Cable Disconnect.

END OF TASK

FUEL SAMPLING

NOTE

Additional information on fuel sampling may be obtained from FM 10-67.

1. Fuel sampling is done during filtered fuel dispensing operation. Fuel is removed through an Aqua-Glo probe and adapter installed on outlet nipple of one or both meters.
2. General fuel sampling instructions are referenced in (WP 0015).

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
FILTERED FUEL SERVICING OPERATIONS (M970A1)

INITIAL SETUP:

References
WP 0008
WP 0009
WP 0012

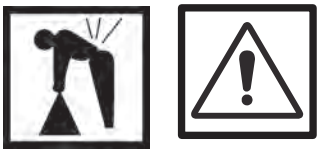
FILTERED SELF-LOAD

NOTE

Use this procedure to load filtered fuel through the bottom of the tank. Fuel is pumped from the storage facility through the filter/separator, meter, 2-1/2 in. (6.35 cm) hose reel, and bottom load adapter.

1. Review General Fuel Handling Instructions (WP 0008).

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

2. Open hose reel cabinet door (Figure 1, Item 1). Pull release cable (Figure 1, Item 2) and lift door with both hands.
3. Make sure that all valves are closed.
4. Connect ground wire to storage facility and semitrailer.

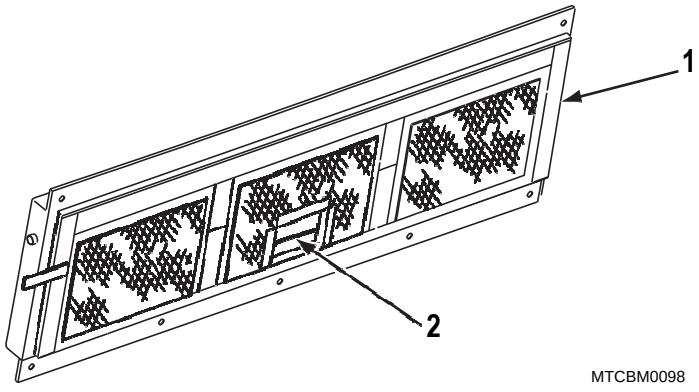


Figure 1. Cabinet Door.

FILTERED SELF-LOAD - Continued

5. Remove 4 in. (10.16 cm) bulk fuel hose from hose trough and connect to storage facility.
6. Remove dust cap from outlet B (Figure 2, Item 10) and connect bulk fuel.
7. Remove fire extinguisher and bring to point of operation.
8. Start engine (WP 0009), and when engine is warm, adjust to idle speed (1000-1200 RPM).
9. Release lock (Figure 2, Item 4) on 2-1/2 in. (6.35 cm) hose reel (Figure 2, Item 3).
10. Unreel 2-1/2 in. (6.35 cm) hose completely.
11. Remove dust cap from bottom load adapter (Figure 2, Item 14) and connect underwing single point nozzle (Figure 2, Item 6).
12. Turn lever on side of nozzle to open the nozzle.

NOTE

Make sure valve E is closed and remains closed during entire self-load operation.

13. Open valve operator A (Figure 2, Item 13) and valves B, G, M, and R (Figure 2, Items 2, 8, 9, and 11).
14. Unreel deadman control S (Figure 2, Item 5) and squeeze lever. Meter inlet pressure gage (Figure 2, Item 7) should read a minimum of 25 psi (172 kPa). Release the deadman control. If meter inlet pressure gage (Figure 2, Item 7) does not indicate a minimum of 25 psi (172 kPa), shut down operation and notify Supervisor.
15. Adjust engine throttle for desired flow rate.

WARNING

When filling tank by means of bottom loading, defueling (M970A1) or self-loading, a test of the pre-check system is mandatory. If this system is not functioning, stop all operations. Determine the problem and have it corrected by a qualified technician. Failure of automatic shut-off to function may cause uncontrolled fuel spillage, fire, and/or explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

16. Squeeze and hold lever on deadman control S (Figure 2, Item 5). Shortly after flow has begun, turn precheck valve D (Figure 2, Item 1) to the OPEN position to check the automatic shut-off float. If float is functional, flow should stop after about 20-25 seconds. If valve is not functioning, stop all operations and notify supervisor.
17. Turn precheck valve D (Figure 2, Item 1) to the CLOSED position. Free flow will resume in about 20 seconds.
18. When tank is full, fuel flow should stop automatically.
19. At end of operation, release the deadman control lever and adjust engine to idle speed (1000-1200 RPM). Rewind the deadman control hose.

FILTERED SELF-LOAD - Continued

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

20. Close underwing single point nozzle (Figure 2, Item 6) and disconnect nozzle from bottom load adapter (Figure 2, Item 14). Reinstall dust caps on bottom load adapter and single point nozzle.
21. Evacuate hose.
22. Rewind 2-1/2 in. (6.35 cm) hose.
23. Tighten hose reel lock (Figure 2, Item 4).
24. Close all valves and remove 4 in. (10.16 cm) bulk fuel hose connecting semitrailer to storage facility.
25. Store hose in hose trough and secure hose trough latches.
26. Reinstall dust cap to outlet B (Figure 2, Item 10).

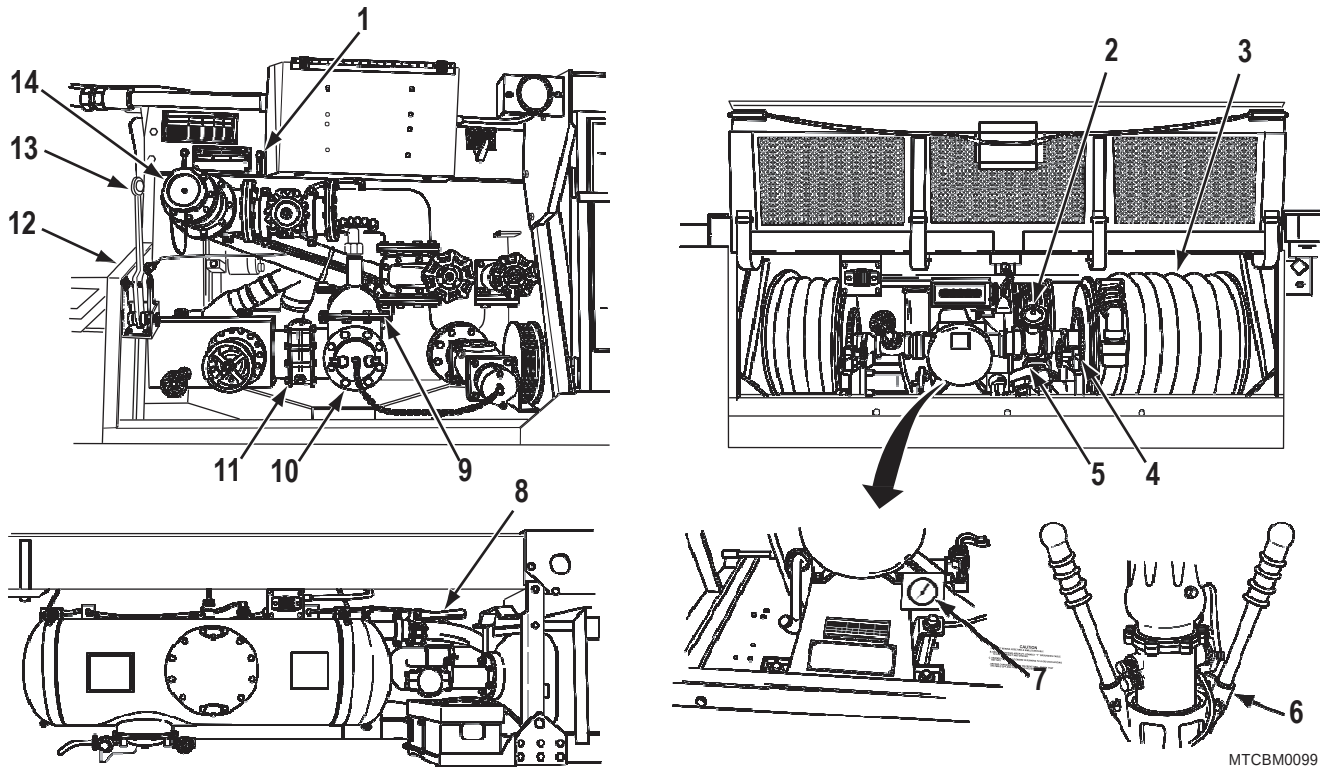


Figure 2. Filtered Fuel Servicing Components (Self Load).

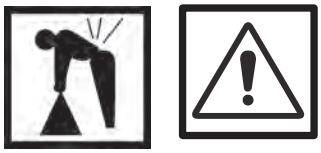
FILTERED SELF-LOAD - Continued

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

27. Shut off engine (WP 0009), then remove the grounding wire.

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

28. Close hose reel cabinet door (Figure 3, Item 1) and latch in place.

29. Store and cover fire extinguishers.

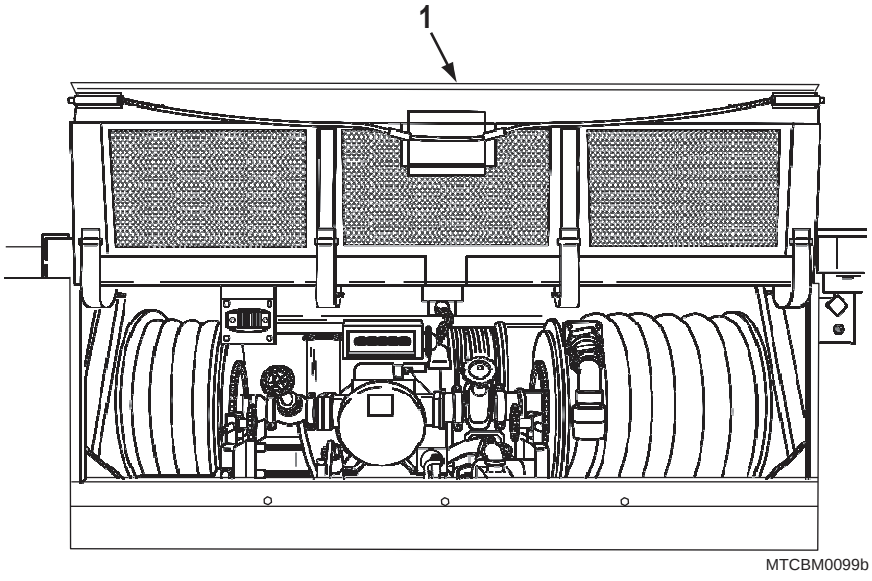


Figure 3. Hose Reel Cabinet.

END OF TASK

FILTERED BULK DELIVERY

NOTE

Use this procedure when filtered fuel is required in the storage facility. Fuel is pumped from the semitrailer tank through the fitter/separator to the storage facility.

1. Review General Fuel Handling Instructions (WP 0008).
2. Operation begins and ends with all valves closed.
3. Connect ground wire to storage facility and semitrailer.
4. Remove 4 in. (10.16 cm) bulk fuel hose from hose trough and connect to receiving facility.
5. Remove dust cap from outlet B (Figure 4, Item 4) and connect bulk fuel hose to outlet.
6. Start engine (WP 0009). When engine is warm, adjust throttle to idle speed (1000-1200 RPM).
7. Open valve operator A (Figure 4, Item 5) and valves B, H, M, and K (Figure 4, Items 1, 2, 3, and 4).

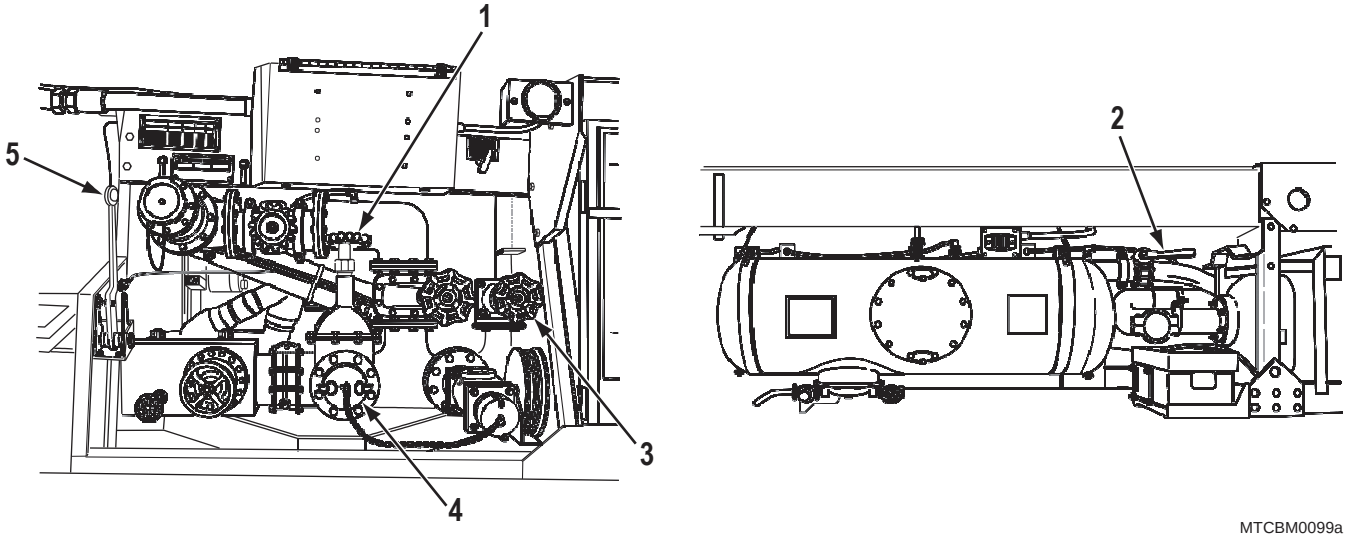


Figure 4. Filtered Fuel Servicing Components (Bulk Delivery).

8. Adjust engine throttle for desired flow rate (WP 0012).
9. At end of operation, adjust engine to idle speed (1000-1200 RPM).
10. Close all valves.
11. Remove bulk fuel hose and store in hose trough.
12. Secure hose trough latches.

FILTERED BULK DELIVERY - Continued

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

13. Reinstall dust cap to outlet B (Figure 4, Item 4) and remove grounding wire.
14. Shut off engine (WP 0009).
15. Store and cover fire extinguishers.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
AIRCRAFT FUEL SERVICING

INITIAL SETUP:

References
WP 0008
WP 0009
WP 0012

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

FUEL SAMPLING

NOTE

- On the M970A1 model, an Aqua-Glo probe and adapter may be installed on outlet nipple of both or either meter for obtaining fuel samples for water content testing.
- Fuel sampling can be done during refueling aircraft and recirculating fuel operations. Fuel is removed through a fuel sampling adapter in the single point nozzle or converter for overwing nozzle as follows:

1. Remove fuel sampling adapter cap (Figure 1, Item 2) from single point nozzle (Figure 1, Item 1) or converter.
2. Have fuel sampling container ready.

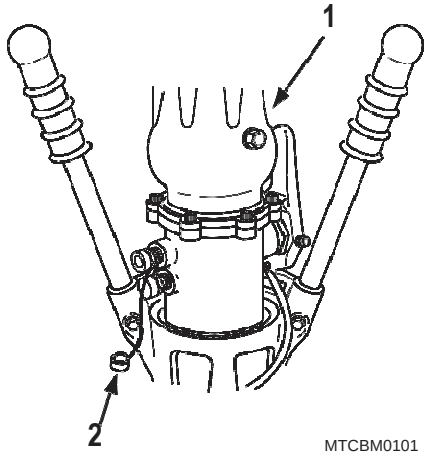


Figure 1. Fuel Sampling Couplings.

FUEL SAMPLING - Continued

NOTE

Make sure fuel sampling hose is placed in container before attaching couplings to adapter. A valve in the adapter opens, allowing fuel to flow into container when connector is screwed into coupling.

3. Remove fuel sampling couplings (Figure 2, Items 1 and 4) from tool box and screw into adapter (Figure 2, Item 5) on single point nozzle (Figure 2, Item 2) or converter.
4. When enough fuel is collected, unscrew fuel sampling coupling from adapter (Figure 2, Item 5). Install cap (Figure 2, Item 3) on adapter (Figure 2, Item 5) and put fuel sampling couplings (Figure 2, Items 1 and 4) in tool box.

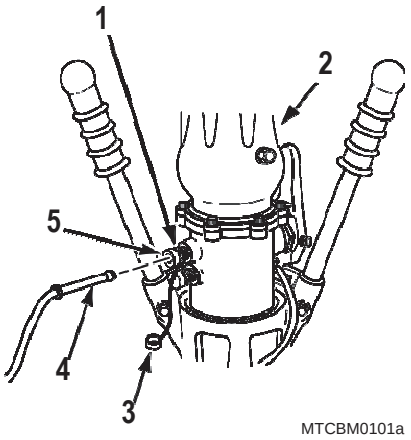


Figure 2. Fuel Sampling Couplings.

END OF TASK

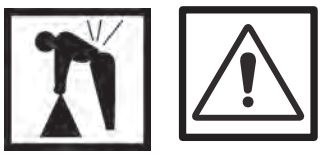
AIRCRAFT SINGLE POINT UNDERWING FUEL DISPENSING OPERATION

NOTE

Use this procedure to dispense metered fuel from semitrailer to an aircraft through an underwing connection. Fuel is pumped through the filter/separator, meter, and hose reel to the aircraft.

1. Refer to (WP 0008) for general fuel handling instructions.

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

2. Open hose reel cabinet door. Pull release cable and lift door with both hands.

AIRCRAFT SINGLE POINT UNDERWING FUEL DISPENSING OPERATION - Continued

3. Operation begins and ends with all valves closed.
4. Unwind the static reel cable (Figure 3, Item 7) and connect it to aircraft.
5. Remove fire extinguishers and bring them to point of operation.
6. Pull emergency valve A control handle (Figure 3, Item 9) to OPEN position and open valves H, M, and R (Figure 3, Items 3, 6, and 8).
7. Reset meter (Figure 3, Item 1) to zero by pushing meter reset knob (Figure 3, Item 2) and turning clockwise.
8. Adjust engine throttle for desired flow rate (WP 0012).

NOTE

The breakaway fitting is a safety feature on hose reel for 2-1/2 in. (6.35 cm) hose. It consists of a breakaway coupling installed between 2-1/2 in. (6.35 cm) hose and outlet port of the hose reel. Should the aircraft be moved with single point nozzle attached to wing, the coupling will break apart as hose is pulled tight against the coupling, preventing damage to the aircraft.

9. Release lock (Figure 3, Item 5) on the 2-1/2 in. (6.35 cm) hose reel (Figure 3, Item 4). Unwind all 50 ft (15.24 m) of 2-1/2 in. (6.35 cm) hose to make sure that breakaway feature will be operable.

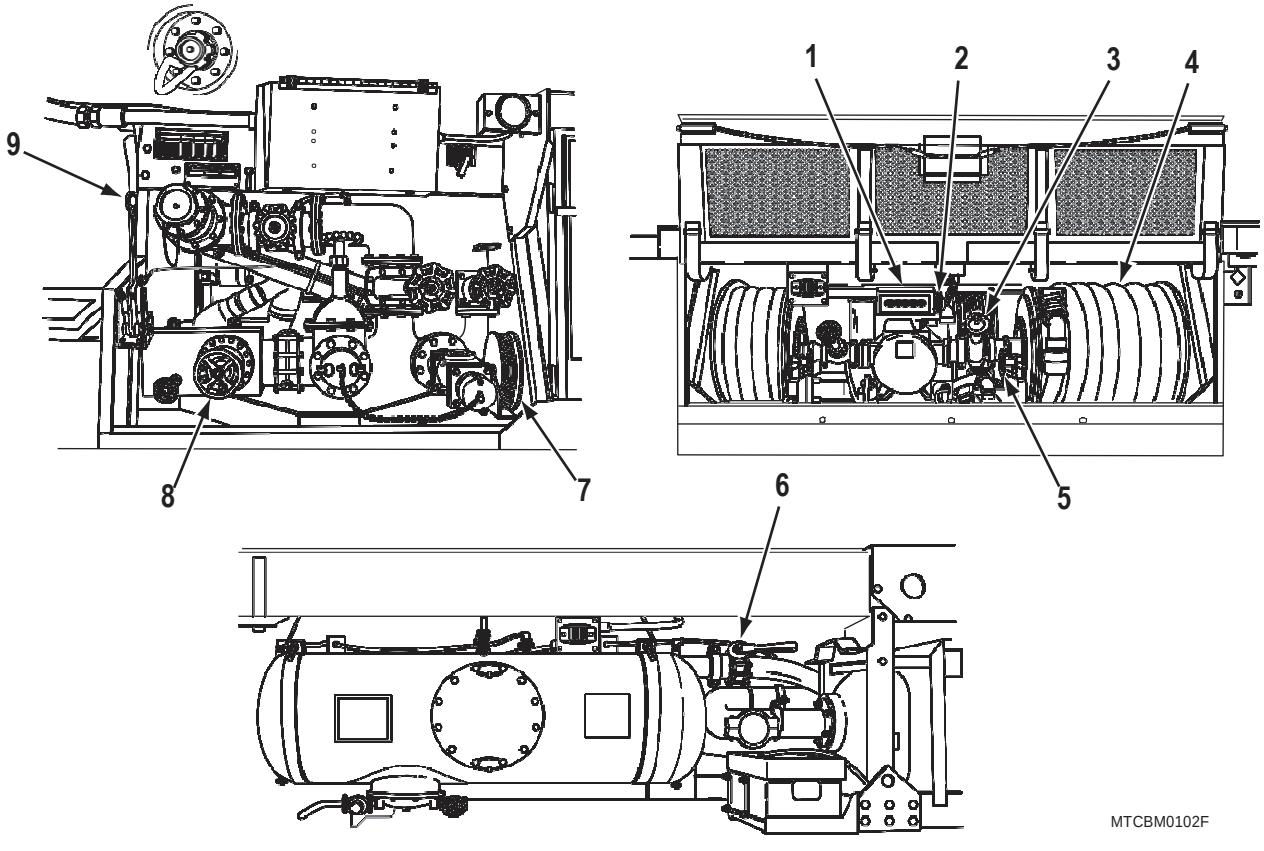


Figure 3. Static Reel (Single Point).

AIRCRAFT SINGLE POINT UNDERWING FUEL DISPENSING OPERATION - Continued

WARNING

Due to the dangers of static electricity while refueling, bonding of the semitrailer to aircraft and grounding procedures are mandatory regardless of the amount of fuel to be dispensed. Bond the fuel nozzle ground wire to the aircraft before bringing nozzle in contact with aircraft. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

10. Attach single point nozzle ground wire (Figure 4, Item 3) to aircraft. Connect single point nozzle (Figure 4, Item 2) to adapter on aircraft. Open nozzle by turning lever (Figure 4, Item 1) on side of nozzle.

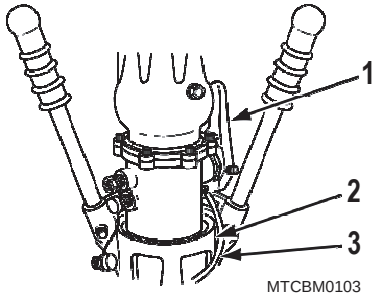


Figure 4. Single Point Nozzle.

11. Unreel deadman control S lever (Figure 5, Item 2) and squeeze lever (Figure 5, Item 4). Meter inlet gage (Figure 5, Item 1) should read a minimum of 25 psi (172 kPa). If gage does not indicate a minimum of 25 psi (172 kPa), shut down operation and contact Field Maintenance.

12. Release lever (Figure 5, Item 4) at end of operation and adjust engine idle speed to 1000-1200 RPM. Rewind the deadman control S lever (Figure 5, Item 2).

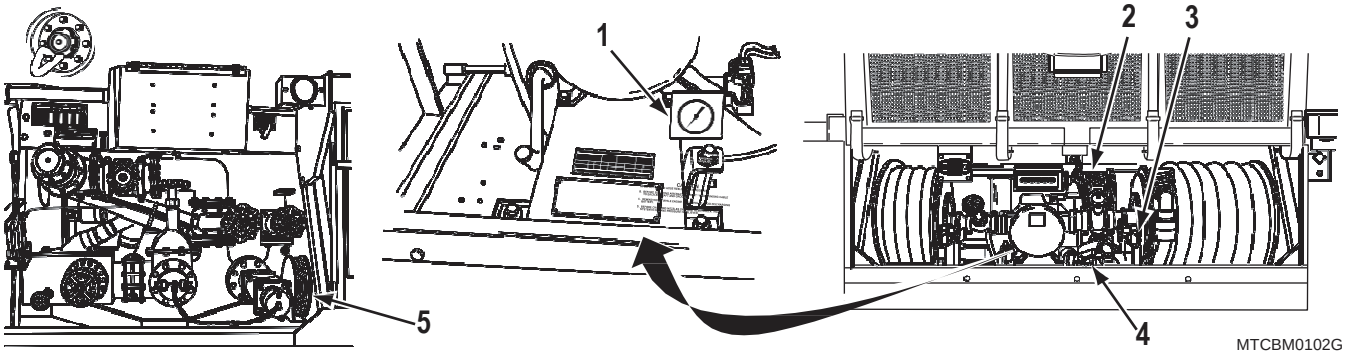


Figure 5. Single Point Underwing Fuel Dispersing (M970A1).

AIRCRAFT SINGLE POINT UNDERWING FUEL DISPENSING OPERATION - Continued

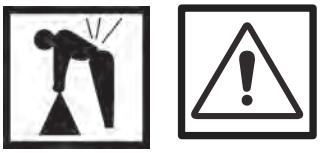
13. Close single point nozzle (Figure 4, Item 2) using lever (Figure 4, Item 1). First disconnect single point nozzle (Figure 4, Item 2) from aircraft, then disconnect the nozzle ground wire (Figure 4, Item 3).
14. Evacuate hose.
15. Rewind the 2-1/2 in. (6.35 cm) hose. Tighten hose reel lock (Figure 5, Item 3).
16. Close all valves and shut off engine (WP 0009).

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

17. Disconnect static reel cable (Figure 5, Item 5) from aircraft. Rewind static reel.

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

18. Close hose reel cabinet door and latch in place.
19. Store and cover fire extinguishers.

END OF TASK

AIRCRAFT OVERWING/CLOSED-CIRCUIT FUEL DISPENSING OPERATION

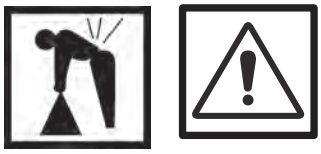
NOTE

Use this procedure to fuel winged aircraft through a fill port on top of aircraft wings. The closed circuit fuel dispensing operation is used to fuel helicopters. Fuel is pumped through the filter/separator, meter, and hose reel to the aircraft or helicopter.

1. Refer to (WP 0008) for general fuel handling instructions.

AIRCRAFT OVERWING/CLOSED-CIRCUIT FUEL DISPENSING OPERATION - Continued

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

2. Open hose reel cabinet door. Pull release cable and lift door with both hands.
3. Make sure all valves are closed.
4. Unwind the static reel cable (Figure 6, Item 8) and connect it to aircraft.
5. Remove fire extinguishers and bring them to point of operation.
6. Start engine (WP 0009). When engine is warm, adjust the throttle idle speed to 1000-1200 RPM.
7. Pull emergency valve A control handle (Figure 6, Item 10) to OPEN position and open valves H, M, and P (Figure 6, Items 5, 6, and 9).
8. Reset meter (Figure 6, Item 3) to zero by pushing meter reset knob (Figure 6, Item 2) and turning clockwise.
9. Adjust engine throttle for desired flow rate (WP 0012).
10. Release hose reel lock (Figure 6, Item 7) on 1-1/2 in. (3.81 cm) hose reel (Figure 6, Item 2). Unwind hose (Figure 6, Item 1) far enough to reach aircraft.

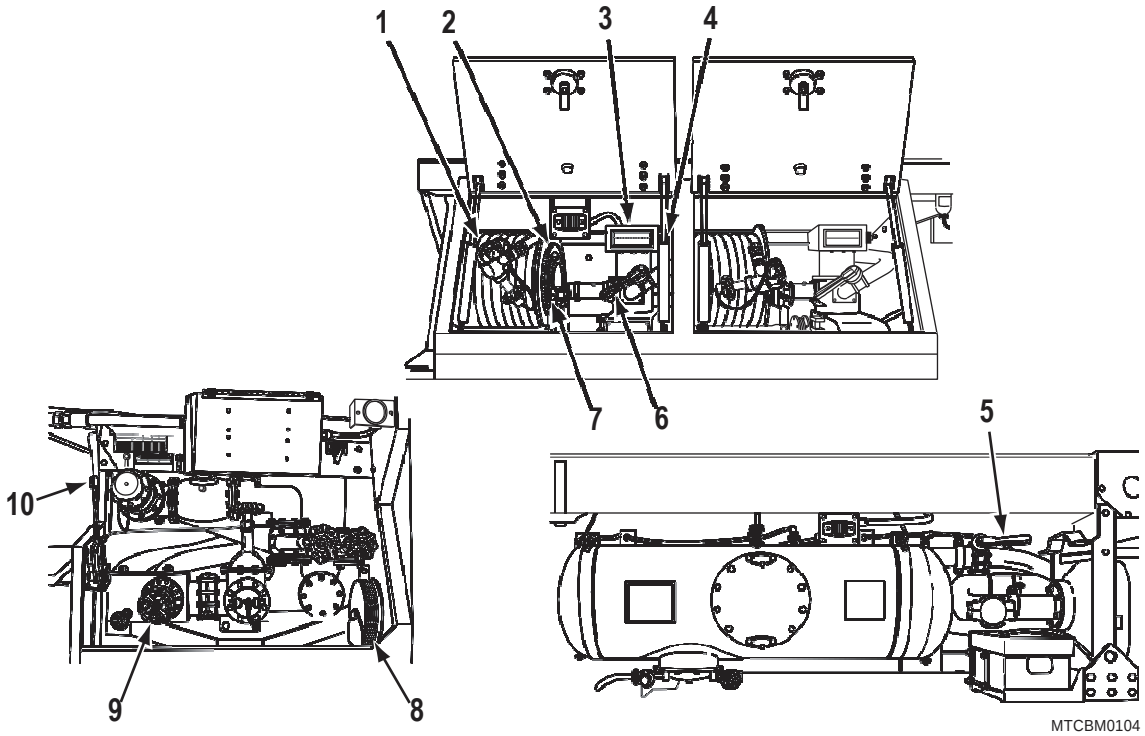


Figure 6. Static Reel (M969A1).

AIRCRAFT OVERWING/CLOSED-CIRCUIT FUEL DISPENSING OPERATION - Continued

WARNING

Due to the dangers of static electricity while refueling, bonding of the semitrailer to aircraft and grounding procedures are mandatory regardless of the amount of fuel to be dispensed. Bond the fuel nozzle ground wire to the aircraft before bringing nozzle in contact with aircraft. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

11. Before removing aircraft fill cap, attach ground wire (Figure 7, Item 3) on bonding clip on the nozzle (Figure 7, Item 1 or 4) to aircraft.
12. Insert overwing nozzle (Figure 7, Item 1) into fill port of aircraft or connect closed-circuit nozzle (Figure 7, Item 4) to helicopter. Squeeze nozzle control handle on overwing nozzle (Figure 7, Item 1) or move handle (Figure 7, Item 6) on closed circuit nozzle (Figure 7, Item 4) to flow position (Figure 7, Item 2). Complete extension of red indicator (Figure 7, Item 5) indicates no flow.
13. At end of operation, release overwing nozzle trigger or return closed-circuit nozzle control handle to the no flow position (Figure 7, Item 6).

NOTE

Do not disconnect nozzle ground wire bond clip before removing nozzle. Always remove nozzle first.

14. Remove overwing nozzle (Figure 7, Item 1) or disconnect closed-circuit nozzle (Figure 7, Item 4) by pulling actuating cable loop. Install aircraft fill cover.

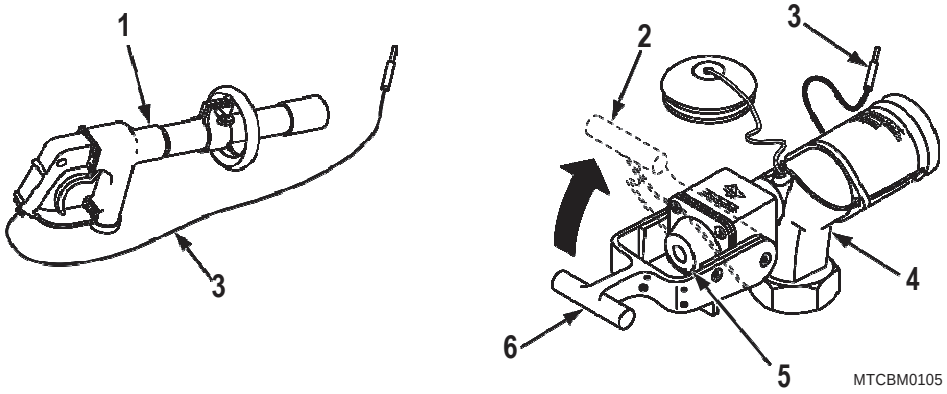


Figure 7. Closed Circuit Nozzle.

AIRCRAFT OVERWING/CLOSED-CIRCUIT FUEL DISPENSING OPERATION - Continued

15. Evacuate hose (Figure 8, Item 1).

CAUTION

DO NOT rewind hose reels simultaneously. Rewind hoses while engine is running to avoid discharging battery. Failure to comply may result in damage to, or destruction of, equipment or mission.

16. Rewind 1-1/2 in. (3.81 cm) hose (Figure 8, Item 1). Tighten hose reel lock (Figure 8, Item 3).

17. Close all valves (Figure 8, Items 2, 4, and 6) and shut off engine (WP 0009).

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

18. Disconnect static reel cable (Figure 8, Item 5) from aircraft. Rewind static reel (Figure 8, Item 5).

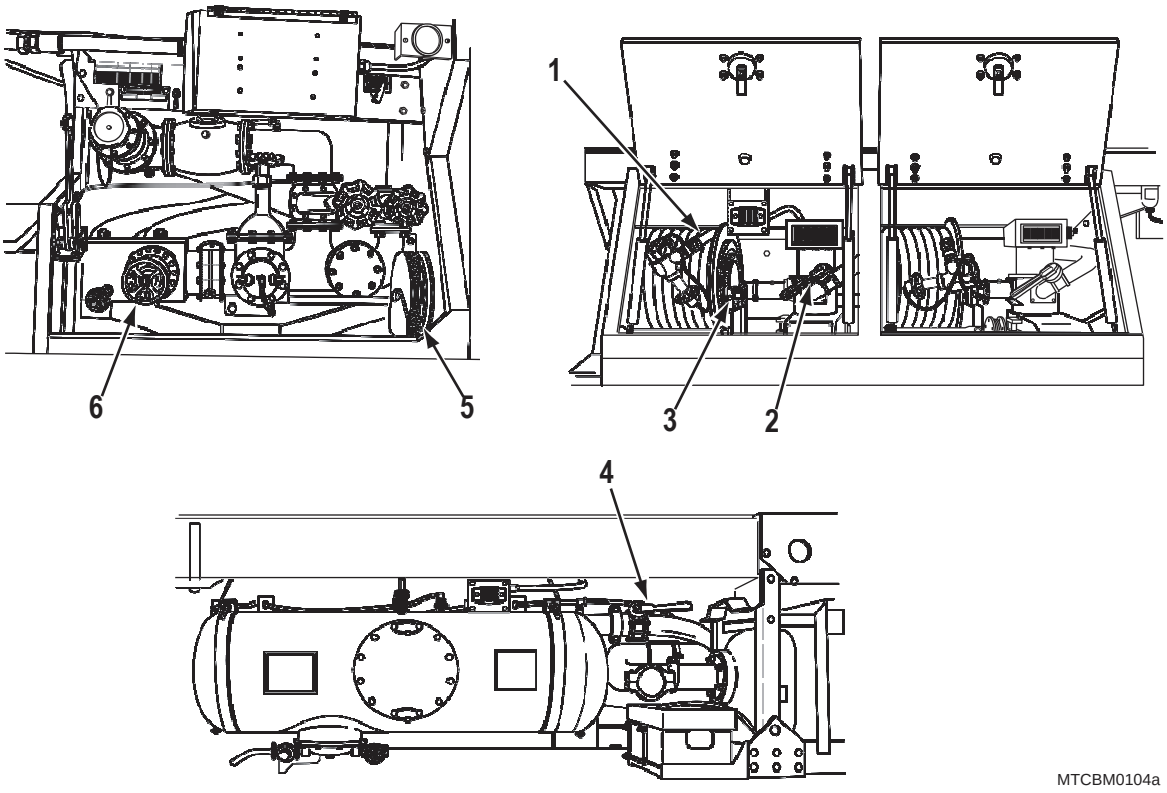
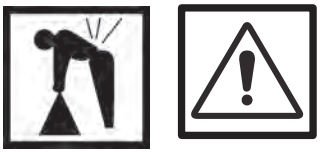


Figure 8. Overwing/Closed Circuit Fuel Dispersing.

AIRCRAFT OVERWING/CLOSED-CIRCUIT FUEL DISPENSING OPERATION - Continued

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

19. Close hose reel cabinet door and latch in place.
20. Store and cover fire extinguishers.

END OF TASK

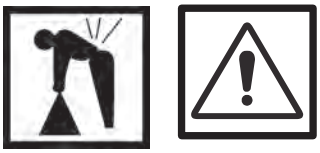
DEFUELING OPERATION WITH 2-1/2 IN. (6.35 CM) HOSE (M970A1)

NOTE

- Use this procedure to remove fuel from aircraft. The fuel is pumped from the aircraft through the filter/separator, meter, and hose reel for the 2-1/2 in. (6.35 cm) hose, bottom load adapter, and into the tank.
- A defueling hose must be available at the site. The semitrailer equipment does not include a defueling hose.
- If vehicle is used to defuel any vehicle, it must be permanently or temporarily marked or stenciled DEFUEL USE ONLY.

1. Refer to (WP 0008) for general fuel handling instructions.

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

2. Open hose reel cabinet door. Pull release cable and lift door with both hands.

DEFUELING OPERATION WITH 2-1/2 IN. (6.35 CM) HOSE (M970A1) - Continued

3. Make sure all valves (Figure 9, Items 2, 5, and 14) are closed.
4. Remove fire extinguishers and bring them to point of operation.
5. Start engine (WP 0009). When warm, adjust engine idle speed to 1000-1200 RPM.

WARNING

Due to the dangers of static electricity while refueling, bonding of the semitrailer to aircraft and grounding procedures are mandatory regardless of the amount of fuel to be dispensed. Bond the fuel nozzle ground wire to the aircraft before bringing nozzle in contact with aircraft. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

6. Unreel static reel cable (Figure 9, Item 10) and connect to aircraft.
7. Release hose reel lock (Figure 9, Item 6) on 2-1/2 in. (6.35 cm) hose reel and unreel hose (Figure 9, Item 7) to full length.
8. Remove the dust cap on the bottom load adapter (Figure 9, Item 16) and connect single point nozzle to bottom load adapter (Figure 9, Item 16).
9. Open single point nozzle by turning handle on side of the nozzle.
10. The defueling hose will be provided at operation site. Remove dust cap from outlet C (Figure 9, Item 12) and connect defueling hose to outlet C (Figure 9, Item 12).
11. Connect the defueling hose ground wire (Figure 9, Item 11) to the aircraft, then connect the hose to outlet C (Figure 9, Item 12).

NOTE

Make sure valve E is closed and remains closed during entire operation.

12. Pull emergency valve A control handle (Figure 9, Item 15) to OPEN position and open valves G, M, and R (Figure 9, Items 1, 5, and 9).
13. Reset meter (Figure 9, Item 3) to zero by pushing in the reset knob and turning clockwise.
14. Set engine throttle at desired flow rate (WP 0012).

DEFUELING OPERATION WITH 2-1/2 IN. (6.35 CM) HOSE (M970A1) - Continued

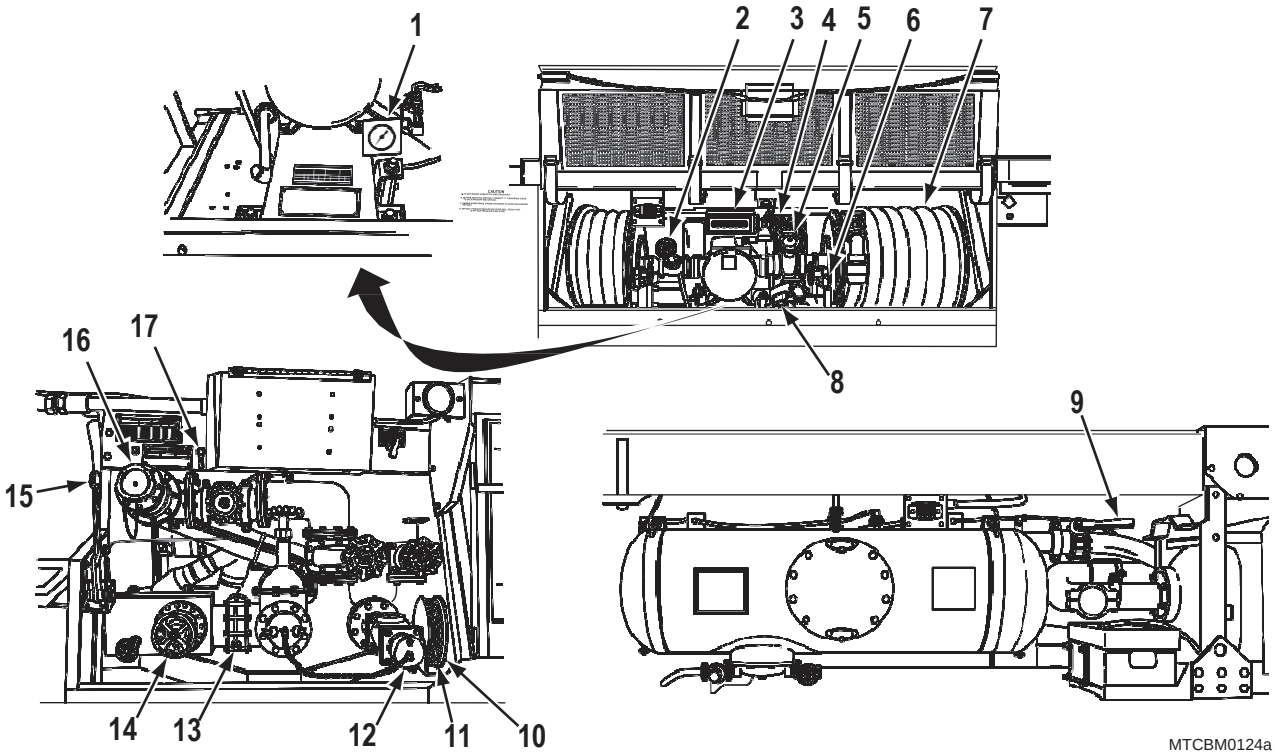


Figure 9. Defueling.

15. Unreel deadman control S lever (Figure 9, Item 4) and squeeze lever (Figure 9, Item 8) to start fuel flow. Meter inlet gage (Figure 9, Item 1) should read a minimum of 25 psi (172 kPa). If not, shut down operation and contact Field Maintenance.

WARNING

When filling tank by means of bottom loading, defueling (M970A1) or self-loading, a test of the pre-check system is mandatory. If this system is not functioning, stop all operations. Determine the problem and have it corrected by a qualified technician. Failure of automatic shut-off to function may cause uncontrolled fuel spillage, fire, and/or explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

16. Shortly after flow has begun, turn precheck valve D (Figure 9, Item 17) to the OPEN position to precheck the automatic shut-off float. After about 20-25 seconds, flow should stop to indicate that the float is working properly.

17. Set precheck valve D (Figure 9, Item 17) to the CLOSED position. Fuel flow will resume in about 20 seconds.

DEFUELING OPERATION WITH 2-1/2 IN. (6.35 CM) HOSE (M970A1) - Continued

18. At end of operation, release lever (Figure 10, Item 6) on deadman control S lever (Figure 10, Item 2) and adjust engine idle speed to 1000-1200 RPM. Rewind deadman control S lever (Figure 10, Item 2).
19. Remove the defueling hose from aircraft, then remove the hose ground wire.
20. Disconnect the defueling hose from outlet C (Figure 10, Item 7).
21. Close single point nozzle and disconnect the nozzle from the bottom load adapter (Figure 10, Item 1). Replace dust cap on single point nozzle and bottom load adapter (Figure 10, Item 1).
22. Evacuate hose.
23. Rewind 2-1/2 in. (6.35 cm) hose. Tighten hose reel lock.
24. Close all valves (Figure 10, Items 2, 5, and 8) and shut off engine (WP 0009).

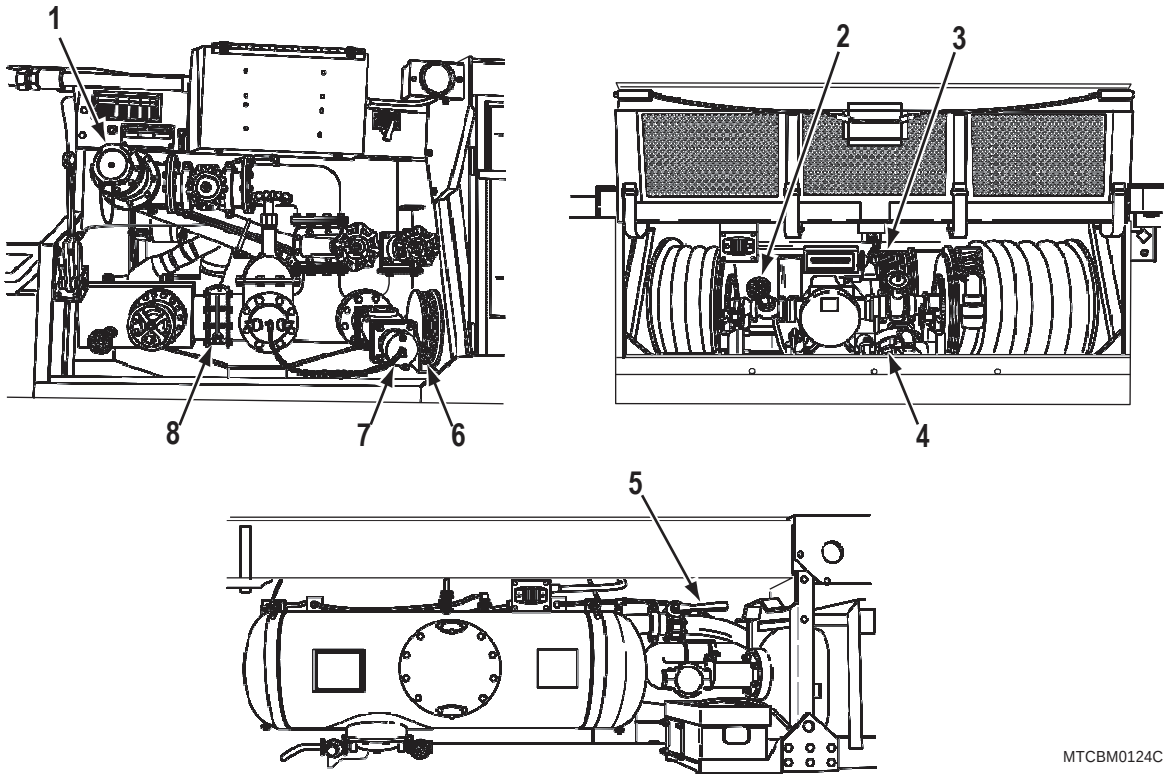


Figure 10. Defueling Operation.

DEFUELING OPERATION WITH 2-1/2 IN. (6.35 CM) HOSE (M970A1) - Continued

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

25. Disconnect the ground connection from the aircraft. Rewind the static reel cable (Figure 10, Item 3).
26. Close hose reel cabinet door and latch in place.
27. Store and cover fire extinguishers.

END OF TASK

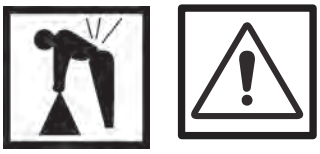
DEFUELING OPERATION WITH 1-1/2 IN. (3.81 CM) HOSE

NOTE

- Use this procedure to remove fuel from an aircraft. The fuel is pumped from the aircraft through a filter/separator, a meter, the hose reel for the 1-1/2 in. (3.81 cm) hose, a bottom load adapter, and into bottom of tank.
- A defueling hose must be available at the site. The semitrailer equipment does not include a defueling hose.
- If vehicle is used to defuel any vehicle, it must be permanently or temporarily marked DEFUEL USE ONLY.

1. Refer to (WP 0008) for general fuel handling instructions.

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

2. Open hose reel cabinet door. Pull release cable and lift door with both hands.

DEFUELING OPERATION WITH 1-1/2 IN. (3.81 CM) HOSE - Continued

3. Make sure all valves (Figure 11, Items 4, 9, and 12) are closed.
4. Remove fire extinguishers and bring them to point of operation.
5. Start engine (WP 0009) and when warm, adjust engine idle speed to 1000-1200 RPM.

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

6. Unreel static reel cable (Figure 11, Item 10) and connect to aircraft.

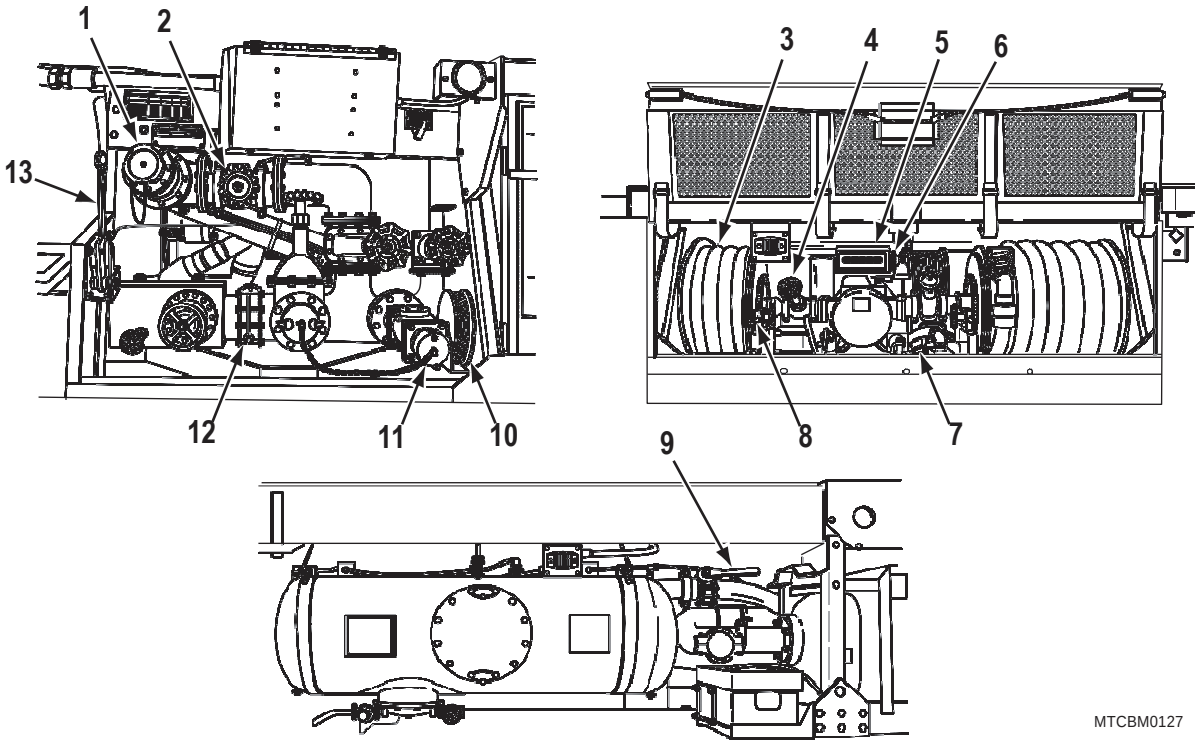


Figure 11. Hose Reel and Static Reel.

7. The converter (Figure 12, Item 2) must be installed on the overwing nozzle (Figure 12, Item 1) for this operation. Remove spout (Figure 12, Item 3) from overwing nozzle (Figure 12, Item 1) and install converter (Figure 12, Item 2).

DEFUELING OPERATION WITH 1-1/2 IN. (3.81 CM) HOSE - Continued

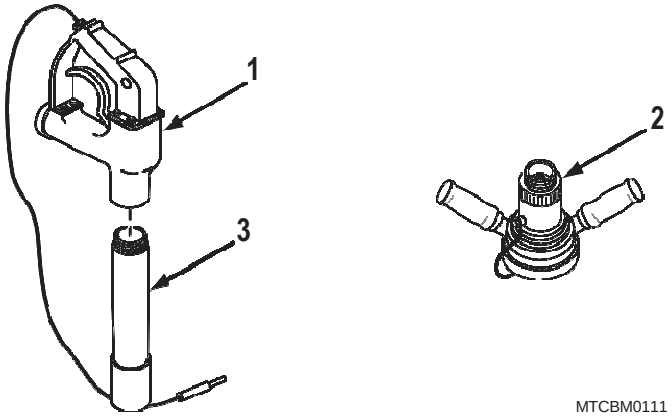


Figure 12. Converter with Fuel Nozzle.

8. Release hose reel lock (Figure 11, Item 8) on 1-1/2 in. (3.81 cm) hose reel and unreel hose (Figure 11, Item 3) to full length.
9. Remove dust cap from bottom load adapter (Figure 11, Item 1) and connect converter to bottom load adapter (Figure 11, Item 1). Open single point nozzle by turning handle on side of the nozzle.
10. Remove dust cap from outlet C (Figure 11, Item 11) and connect defueling hose to outlet C. Next, connect the defueling hose ground wire to the aircraft, then connect the hose to outlet C (Figure 11, Item 11).

NOTE

Make sure valve E (Figure 11, Item 2) is closed and remains closed during entire operation.

11. Pull emergency valve A control handle (Figure 11, Item 13) to OPEN position and open valves G, M, and P (Figure 11, Items 4, 9, and 12).
12. Reset meter (Figure 11, Item 5) to zero by pushing in the reset knob (Figure 11, Item 6) and turning clockwise.

NOTE

If 2-1/2 in. (6.35 cm) hose was used before using 1-1/2 in. (3.81 cm), depress and hold deadman release plunger in the hose reel cabinet for 5-10 seconds to deactivate the deadman system. If this procedure is not followed, no fuel will flow to 1-1/2 in. (3.81 cm) hose.

13. Pull emergency valve A control handle (Figure 11, Item 13) to OPEN position and open valves G, M, and P (Figure 11, Items 4, 9, and 12).

DEFUELING OPERATION WITH 1-1/2 IN. (3.81 CM) HOSE - Continued

WARNING

When filling tank by means of bottom loading, defueling (M970A1) or self-loading, a test of the pre-check system is mandatory. If this system is not functioning, stop all operations. Determine the problem and have it corrected by a qualified technician. Failure of automatic shut-off to function may cause uncontrolled fuel spillage, fire, and/or explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

14. Shortly after flow has begun, turn precheck valve D (Figure 13, Item 1) to the OPEN position to precheck the automatic shut-off float. After about 20-25 seconds, flow should stop to indicate that the float is working properly.
15. Set precheck valve D (Figure 13, Item 1) to the CLOSED position. Fuel flow will resume in about 20 seconds.
16. At end of operation, release trigger on the overwing nozzle and adjust engine idle speed to 1000-1200 RPM.
17. Remove the defueling hose from aircraft, then remove the hose ground wire. Disconnect the defueling hose from outlet C (Figure 13, Item 3). Replace the dust cap on outlet C (Figure 13, Item 3).

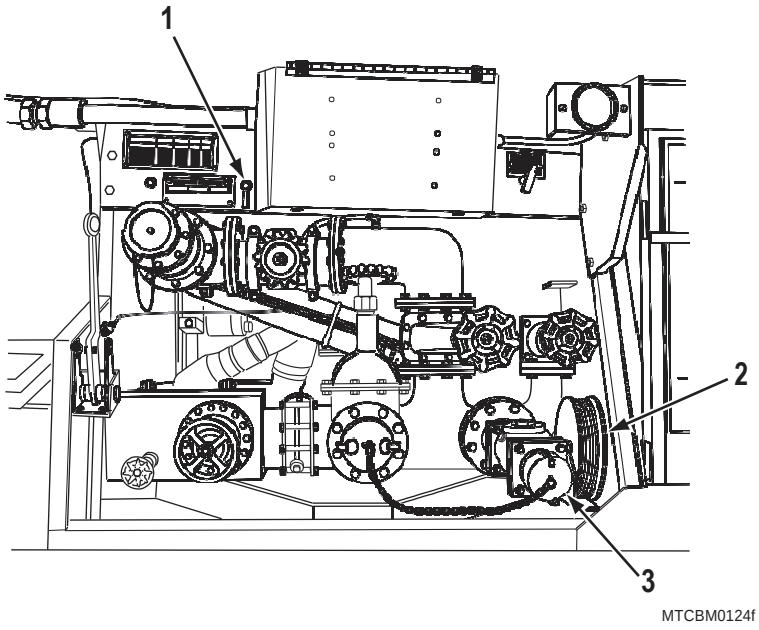


Figure 13. Static Reel Cable.

DEFUELING OPERATION WITH 1-1/2 IN. (3.81 CM) HOSE - Continued

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

18. Disconnect the ground connection from the aircraft. Rewind the static reel cable (Figure 13, Item 2).
19. Disconnect the overwing nozzle (Figure 14, Item 1) and converter (Figure 14, Item 2) from the bottom of the load adapter. Replace dust cap on bottom of load adapter.

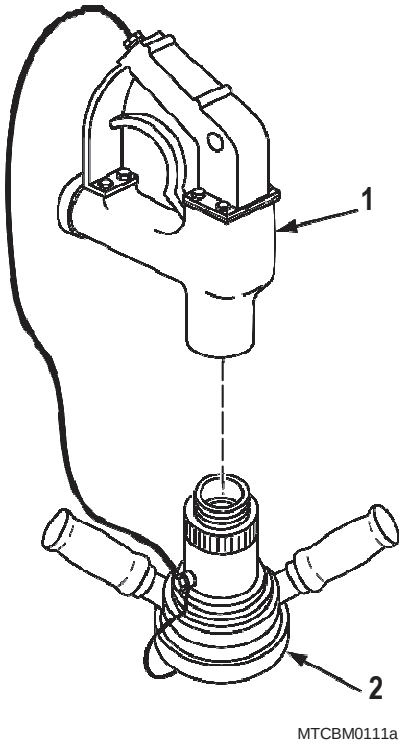


Figure 14. Overwing Nozzle.

20. Evacuate the hose.

DEFUELING OPERATION WITH 1-1/2 IN. (3.81 CM) HOSE - Continued

CAUTION

DO NOT rewind hose reels simultaneously. Rewind hoses while engine is running to avoid discharging battery. Failure to comply may result in damage to, or destruction of, equipment or mission.

21. Rewind the 1-1/2 in. (3.81 cm) hose (Figure 15, Item 1). Tighten hose reel lock (Figure 15, Item 5).
22. Close all valves and shut off engine (WP 0009).
23. Remove converter (Figure 15, Item 3) from overwing nozzle (Figure 15, Item 2) and install spout (Figure 15, Item 4) to nozzle.
24. Close hose reel cabinet door and latch it in place.
25. Store and cover fire extinguishers.

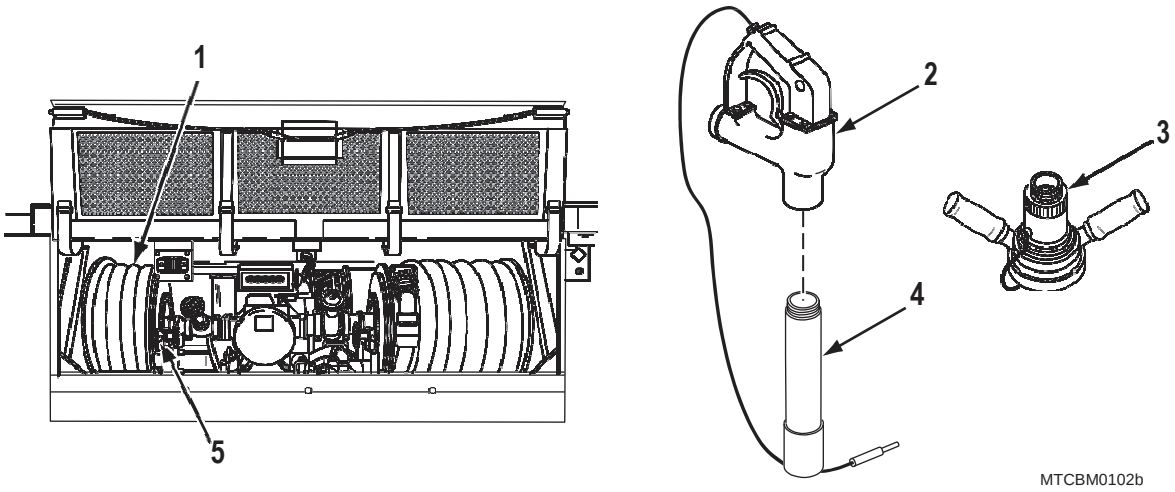


Figure 15. 1-1/2 in. (3.81 cm) Hose Storage.

END OF TASK

RECIRCULATION OPERATION WITH 2-1/2 IN. (6.35 CM) HOSE (M970A1)

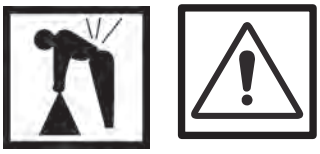
NOTE

Use this procedure when the fuel in the tank must be refiltered. The fuel is recirculated through the filter/separator, meter, hose reel for the 2-1/2 in. (6.35 cm) hose, and recirculation fitting on side of tank.

1. Refer to (WP 0008) for general fuel handling instructions.

RECIRCULATION OPERATION WITH 2-1/2 IN. (6.35 CM) HOSE (M970A1) - Continued

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

All fuel dispensing operations begin and end with all valves closed.

2. Open hose reel cabinet door. Pull release cable and lift door with hands.
3. Unreel the static reel cable (Figure 16, Item 1) and connect to an approved earth ground.

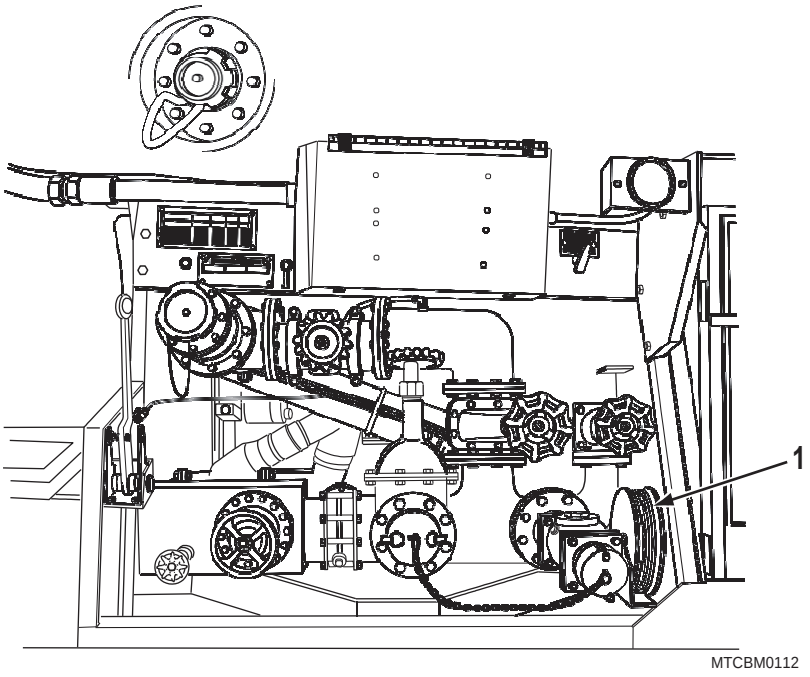


Figure 16. Static Reel Cable (M970A1).

4. Remove fire extinguishers and take to the point of operation.
5. Start engine (WP 0009) and when warm, adjust engine idle speed to 1000-1200 RPM.

RECIRCULATION OPERATION WITH 2-1/2 IN. (6.35 CM) HOSE (M970A1) - Continued

6. Release lock (Figure 17, Item 6) on the 2-1/2 in. (6.35 cm) hose reel (Figure 17, Item 4) and completely unreel hose (Figure 17, Item 5). Remove dust cap (Figure 17, Item 1) on the recirculation fitting and connect single point nozzle (Figure 17, Item 8) to the fitting. Open single point nozzle (Figure 17, Item 8) by turning handle on side of nozzle.
7. Pull emergency valve A control handle (Figure 17, Item 13) to OPEN position and open valves H, M, and R (Figure 17, Items 3, 11, and 12).
8. Set engine throttle at desired flow rate.

NOTE

Pneumatic air source must be available for deadman recirculation operation.

9. Unreel deadman control S lever (Figure 17, Item 7). Squeeze lever (Figure 17, Item 7) to start fuel flow. Meter inlet pressure gage (Figure 17, Item 9) should indicate a minimum 25 psi (172 kPa). If not, shut down operation and contact Field Maintenance.
10. At end of operation, release lever (Figure 17, Item 7) and adjust engine idle speed to 1000-1200 RPM. Rewind deadman control S lever (Figure 17, Item 7).
11. Close the single point nozzle (Figure 17, Item 8) and disconnect nozzle (Figure 17, Item 8) from recirculation fitting. Replace dust cap (Figure 17, Item 1) on recirculation fitting.
12. Evacuate hose.
13. Rewind the 2-1/2 in. (6.35 cm) hose (Figure 17, Item 5). Tighten hose reel lock (Figure 17, Item 6).
14. Close all valves and shut off engine (WP 0009).

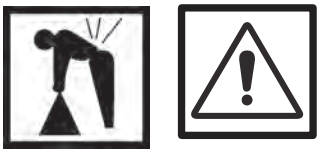
WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

15. Disconnect the static reel cable (Figure 17, Item 10) from its ground connection and rewind cable (Figure 17, Item 10).

RECIRCULATION OPERATION WITH 2-1/2 IN. (6.35 CM) HOSE (M970A1) - Continued

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

16. Close hose reel cabinet door and latch it in place.
17. Store and cover fire extinguishers.

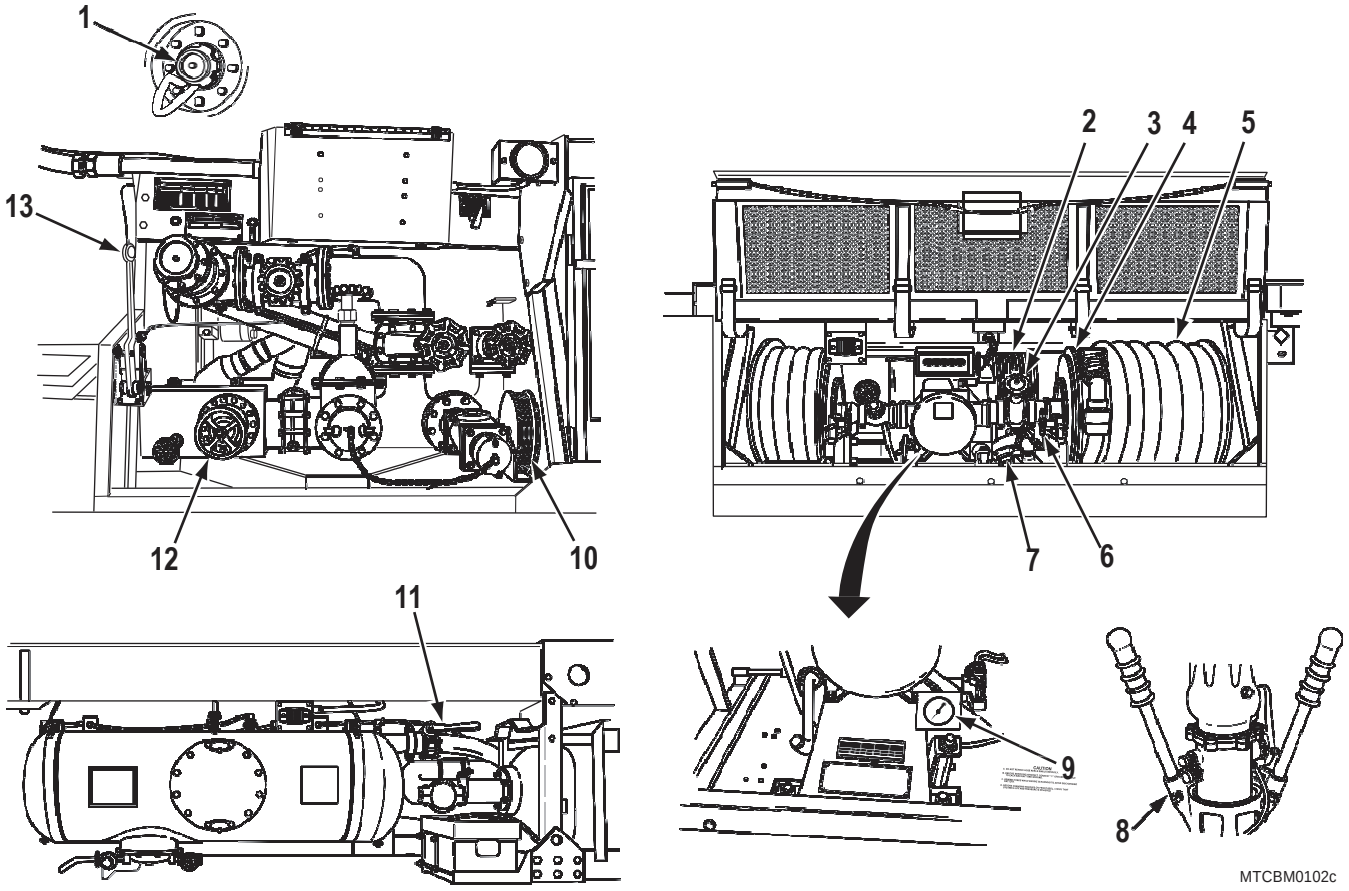


Figure 17. Hose Reel Lock.

END OF TASK

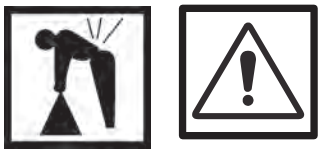
RECIRCULATION OPERATION WITH 1-1/2 IN. (3.81 CM) HOSE (M970A1)

NOTE

Use this procedure when the fuel in the tank must be refiltered. The fuel is recirculated through the filter/separator, meter, hose reel for the 1-1/2 in. (3.81 cm) hose and recirculation fitting on side of tank.

1. Refer to (WP 0008) for general fuel handling instructions.

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

2. Open hose reel cabinet door. Pull release cable and lift door with both hands.
3. Operation begins and ends with all valves closed.
4. Unreel the static reel cable (Figure 18, Item 7) and connect to an approved ground (earth).

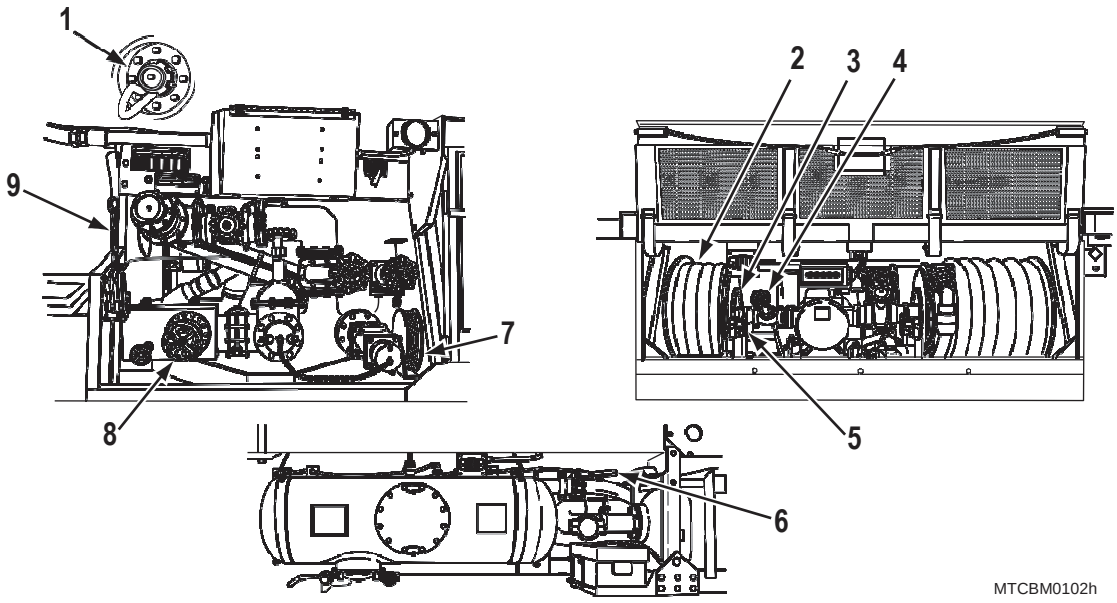


Figure 18. Static Reel Disconnection.

5. Remove fire extinguishers and take to the point of operation.
6. Start engine (WP 0009) and when warm, adjust engine idle speed to 1000-1200 RPM.
7. Remove spout (Figure 19, Item 3) from overwing nozzle (Figure 19, Item 1) and install quick-disconnect converter (Figure 19, Item 2) on nozzle (Figure 19, Item 1).

RECIRCULATION OPERATION WITH 1-1/2 IN. (3.81 CM) HOSE (M970A1) - Continued

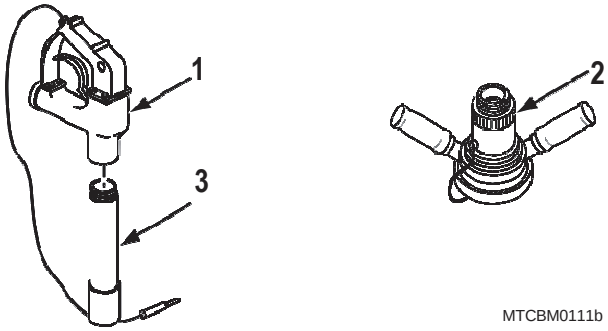


Figure 19. Converter and Nozzle.

8. Release lock (Figure 18, Item 5) on the 1-1/2 in. (3.81 cm) hose reel (Figure 18, Item 3) and unreel all of the hose (Figure 18, Item 2).
9. Remove dust cap on the recirculation fitting (Figure 18, Item 1) and connect the converter (Figure 18, Item 2) to the fitting.
10. Pull emergency valve A control handle (Figure 18, Item 9) to OPEN position and open valves H, M, and P, (Figure 19, Items 4, 6, and 8).

NOTE

If 2-1/2 in. (6.35 cm) hose was used before using 1-1/2 in. (3.81 cm) hose, depress and hold deadman release plunger in the hose reel cabinet for 5-10 seconds to deactivate the deadman system. If this procedure is not followed, no fuel will flow to 1-1/2 in. (3.81 cm) hose.

11. Set engine throttle at desired flow rate (WP 0012).
12. Squeeze trigger on overwing nozzle (Figure 19, Item 1).
13. At end of operation, release the trigger on the overwing nozzle (Figure 18, Item 1) and adjust engine idle speed to 1000-1200 RPM.
14. Disconnect the overwing nozzle (Figure 19, Item 1) and converter (Figure 19, Item 2) from the recirculation fitting (Figure 18, Item 1). Reinstall dust cap to fitting.
15. Evacuate the hose.
16. Rewind the 1-1/2 in. (3.81 cm) hose (Figure 18, Item 2). Tighten hose reel lock (Figure 18, Item 5).
17. Close all valves and shut off engine (WP 0009).
18. Remove converter (Figure 19, Item 2) from overwing nozzle (Figure 19, Item 1) and install spout to nozzle (Figure 19, Item 3).

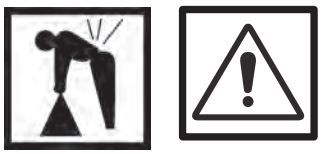
RECIRCULATION OPERATION WITH 1-1/2 IN. (3.81 CM) HOSE (M970A1) - Continued

WARNING

Do not let go of static reel cable when rewinding until the ball stop is firmly touching the reel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

19. Disconnect the static reel cable (Figure 20, Item 1) from its ground connection and rewind cable (Figure 20, Item 1).

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

20. Close hose reel cabinet door and latch it in place.

21. Store and cover fire extinguishers.

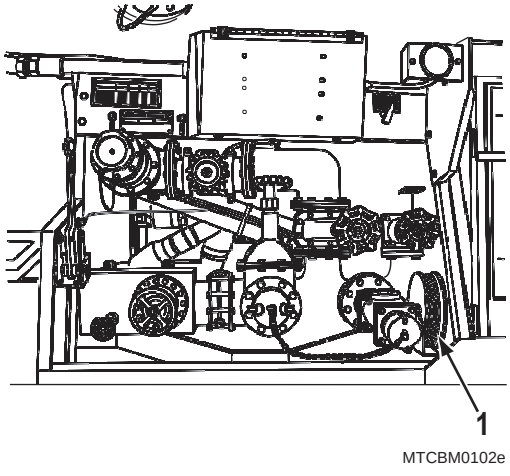


Figure 20. Recirculation Operation With 1-1/2 in. (3.81 cm) Hose Reel.

END OF TASK

END OF WORK PACKAGE

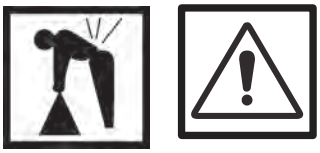
OPERATOR MAINTENANCE
REFUEL ON THE MOVE (ROM) ASSEMBLY AND OPERATING PROCEDURES (M969A1 AND M969A2)

INITIAL SETUP:

References
FM 10-67-1

REFUEL ON THE MOVE (ROM) ASSEMBLY AND OPERATING PROCEDURES (M969A1 AND M969A2)

WARNING



The hose reel cabinet door weighs 45 lbs (20.4 kg). To prevent injury, use two hands when opening and closing. Use latches to lock door. Do not slam cabinet door. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Components of the Refuel on the Move (ROM) Assembly Kit (NSN 4730-01-295-1842) are listed in rear of this manual.

The M969A1 and M969A2 fuel tankers have Refuel on the Move capabilities. For instructions on installing, operating, and disassembling the ROM kit, refer to FM 10-67-1.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
RELEASE OF FAIL-SAFE BRAKES

INITIAL SETUP:

Not Applicable

WARNING

The following procedures can be used when air reservoir can be recharged by connecting air lines to tractor or by using a standard air hose and filling reservoir through filler valve. When filling through filler valve, fill front (secondary) reservoir only. Attempting to use this procedure with no air source available may result in damage to equipment or serious injury to personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

M970A1 brakes will not release unless hose reel cabinet is closed.

RESERVE AIR RELEASE

NOTE

Use this procedure if semitrailer is to be moved by other than the Prime Mover. Pressure readings can be checked with standard tire gage.

1. Push brake release plunger (Figure 1, Item 1) on roadside of semitrailer to release fail-safe brakes. Air in front reservoir will allow brakes to release twice.
2. When pressure falls under 55 psi (379.22 kPa), recharge air reservoir by connecting air lines to Prime Mover or by using a standard air hose and fill front (secondary) reservoir through filler valve (Figure 1, Item 2).
3. Fill to air gage reading 90-100 psi (620.55-689.50 kPa).

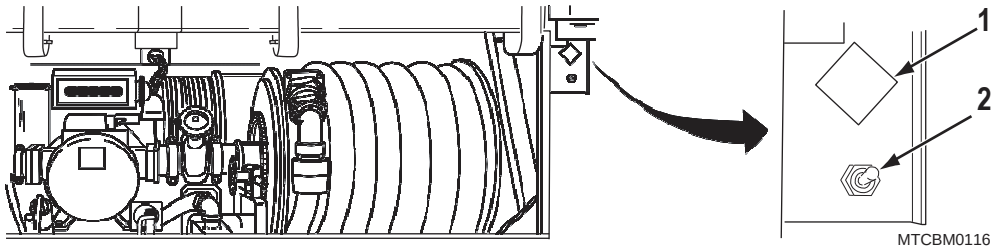


Figure 1. Brake Release and Filler Valve.

END OF TASK

MANUAL RELEASE (CAGING) (M967A1, M969A1, AND M970A1)

1. Block wheels to prevent semitrailer movement.
2. Remove nut (Figure 2, Item 1) and release tool (Figure 2, Item 2) from mounting hole in fail-safe unit.
3. Remove plug.
4. Insert release tool (Figure 2, Item 2) into hole and turn 1/4-turn to seat release tool (Figure 2, Item 2) in pressure plate.
5. Install nut (Figure 2, Item 1) on release tool (Figure 2, Item 2) and torque until 2-1/2 to 2-3/4 in. (6.35 to 6.99 cm) of release tool (Figure 2, Item 2) is exposed.
6. Repeat Steps 2 through 5 for remaining fail-safe units.
7. As soon as air is available to refill reservoirs, remove release tool (Figure 2, Item 2) and nut (Figure 2, Item 1) from each of four fail-safe units and install in mounting holes.
8. Install plugs.

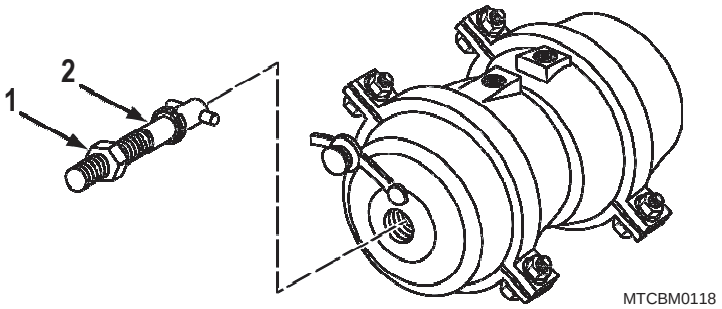


Figure 2. Cage Bolt.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
OPERATION UNDER UNUSUAL CONDITIONS

INITIAL SETUP:

Tools and Special Tools
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Materials/Parts
Rag, Wiping (WP 0293, Table 1, Item 20)

References
FM 9-207

References (cont.)
FM 21-305
FM 55-30
SF Form 368
TC 21-305-20
TM 9-247
WP 0079
WP 0286

GENERAL

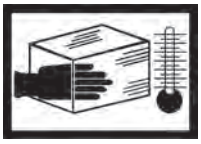
In addition to the normal preventive maintenance service, special care in cleaning and lubrication must be observed where extremes of temperature, humidity, and terrain conditions are present or anticipated. Proper cleaning, lubrication, and storage handling of fuels and lubricants not only ensure proper operation and functioning, but also guard against excessive wear in the working parts and deterioration of materials.

FM 55-30 contains instructions on driver selection, training, and supervision. TC 21-305-20 prescribes special driving instructions for operating wheeled vehicles under unusual conditions. A detailed study of these manuals is essential for the use of this material under unusual conditions.

When chronic failure of the materiel results from subjection to extreme conditions, report the conditions on SF Form 368.

OPERATION IN EXTREME COLD

WARNING



- Sudden changes in temperature may cause leaks at fittings and connectors. Inspect all fittings and connectors, and report all leaks to Field Maintenance before operating trailer. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Skin will freeze faster during fuel handling operations in extreme cold conditions. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Extensive preparation of materiels scheduled for operation in extreme cold weather is necessary. Generally, extreme cold causes lubricants to thicken or congeal, cracks insulation, causes electrical short circuits, and various construction materials become hard, brittle, and easily damaged or broken.
2. The operator must always be on the alert for indications of the effect of the cold weather on the semitrailer.
3. Tires may freeze to ground or have flat spots if under inflated.
4. Use caution when placing the vehicle in motion after a shutdown. Congealed lubricants may cause failure of parts. Tires frozen to the ground or frozen to the shape of the flat spot while under inflated must be considered. One or more brake shoes may be frozen fast and require preheating to avoid damage to the Prime Mover clutch surfaces.
5. Refer to FM 9-207 for description of operation in extreme cold.
6. Refer to (WP 0286) for proper lubrication during extreme cold weather conditions.
7. Clean all parts of semitrailer. Remove snow, ice, and mud as soon as possible after operation. Perform AFTER operations Preventative Maintenance Checks and Services (PMCS) checks (WP 0079).
8. At Halt or Parking.
   a. When halted for short shutdown periods, park semitrailer in a sheltered spot out of the wind. If no shelter is available, park so the rear of the semitrailer faces into the wind. For long shutdowns, if high and dry ground is not available, prepare a footing of planks or brush.
   b. Clean all parts of the semitrailer of snow, ice and/or mud as soon as possible after operation. Perform AFTER operation PMCS checks (WP 0079).
   c. Gage tires for correct pressure.

OPERATION IN EXTREME COLD - Continued

9. Shield the semitrailer with canvas covers, if available. Keep cover ends off the ground to keep them from freezing to the ground.

END OF TASK

OPERATION IN EXTREME HEAT AND HIGH HUMIDITY

WARNING

Fuel will expand and become more flammable in extreme heat conditions. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Refer to (WP 0286) for proper lubrication during extreme heat conditions. Adequate lubrication is essential. Extreme heat will cause oil films to evaporate, resulting in inadequate lubrication.
2. Keep tires protected from direct sunlight to prevent increases in air pressure and deterioration of rubber.
3. Cover inactive semitrailer with tarpaulins, if they are available and there is no other shelter. Shake out and air canvas covers or other items subject to deterioration from mildew or attacks by insects or vermin for several hours weekly.
4. Semitrailers, inactive for long periods of time in hot, humid weather, are subject to rapid rusting and accumulation of fungi growth. Frequently inspect, clean, and lubricate to prevent excessive deterioration.
5. Protect semitrailer from direct rainfall, if possible.
6. Dampness increases corrosive action. Inspect painted surfaces and electrical connections more frequently for damage.

END OF TASK

OPERATION IN MUD AND SNOW

1. After each operation, remove snow, ice and/or mud from underneath semitrailer and hoses, lines, tubes, and electrical connections.
2. Refer to FM 21-305 for special instructions on driving hazards in snow.
3. Immediately after operation in mud or snow, thoroughly clean, inspect, and lubricate semitrailer if tactical situation permits. Refer to (WP 0286) for proper lubrication instructions.

END OF TASK

OPERATION IN DUSTY OR SANDY AREAS

1. For continued operation in sand, oversize balloon sand tires may be necessary. The tread should be plain rib and the tire of round cross section.
2. Inspect, clean and lubricate frequently when operating in dusty or sandy areas. Refer to (WP 0286) for proper lubrication instructions.
3. Make sure no dust or sand enters exposed mechanisms or lubrication fittings during inspections and repair operations. Cover exposed parts with tarpaulins or other suitable cover during disassembly and assembly.
4. When beginning operation in dusty or sandy areas, remove lubricants from exposed components (such as landing gear), if tactical situation permits. Grease and oil will cause dust and sand to accumulate and act as an abrasive, causing rapid wear.

END OF TASK

OPERATION IN SALTWATER AREAS

1. Wash salt deposits from all equipment with fresh water. Observe the precautions in operation under humid conditions.
2. Moist and salty areas can destroy rust preventative qualities of oils and greases. When equipment is active, exposed surfaces should be cleaned and lubricated daily. Refer to (WP 0286) for proper lubrication instructions.
3. When equipment is inactive, unpainted parts should be coated with lubricating oil (WP 0286). All covers and caps should be in place.

END OF TASK

FORDING

1. Instructions for fording operations for the Prime Mover also apply to the semitrailer.
2. Fording depth of the semitrailer is limited to the fording depth limit of the cargo or the Prime Mover, whichever is lower.
3. Reduce tire pressure to 32 psi (221 kPa) to aid in amphibious landings.
4. Thoroughly clean and dry all surfaces as soon as mission allows.

END OF TASK

END OF WORK PACKAGE

CHAPTER 3

TROUBLESHOOTING PROCEDURES

TROUBLESHOOTING INDEX

	Malfunction/Symptom	Troubleshooting Procedure
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2.	ENGINE IS HARD TO START OR TURNS OVER SLOWLY	WP 0021
3.	ENGINE TURNS OVER BUT FAILS TO START	WP 0022
4.	ENGINE MISFIRES AT HEAVY LOAD OR ENGINE POWER IS LOW	WP 0023
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- Continued

	Malfunction/Symptom	Troubleshooting Procedure
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- Continued

	Malfunction/Symptom	Troubleshooting Procedure
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END OF WORK PACKAGE

OPERATOR MAINTENANCE
ENGINE WILL NOT TURN OVER

INITIAL SETUP:

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

ENGINE WILL NOT TURN OVER

MALFUNCTION

BATTERIES ARE UNSERVICEABLE

CORRECTIVE ACTION

Check battery voltage indicator reading on engine control panel (Figure 1, Item 1).

- If reading is not 12-14 V dc, notify Field Maintenance.
- If reading is 12-14 V dc, notify Field Maintenance.
- Verify problem is solved.

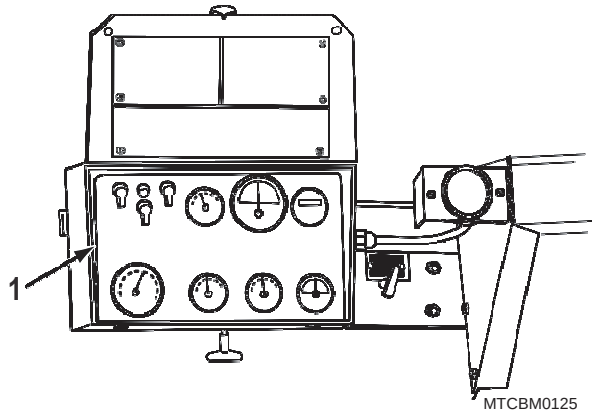


Figure 1. Engine Control Panel.

MALFUNCTION

LOOSE OR CORRODED BATTERY CABLE TERMINALS

CORRECTIVE ACTION

Remove battery cover and check for corroded or loose cable terminals (Figure 2, Item 2).

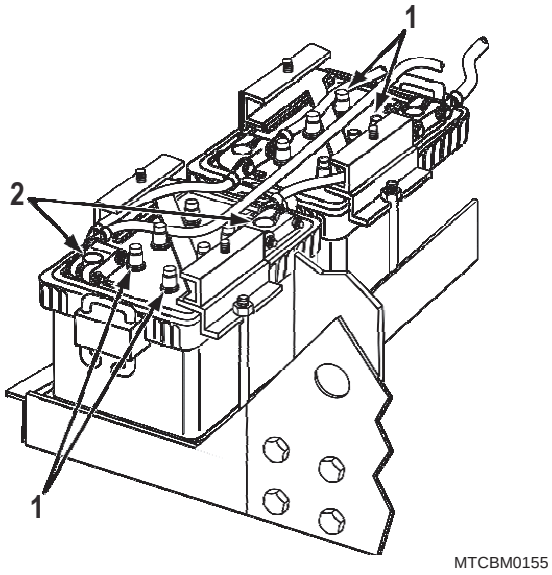


Figure 2. Batteries.

- Tighten and clean any loose or corroded battery terminals.
- Verify problem is solved.

MALFUNCTION

LOW ELECTROLYTES

CORRECTIVE ACTION

WARNING

Do not attempt to jump-start engine. Jump-starting may result in damage to batteries or serious fire hazard. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Remove vent fill caps (Figure 2, Item 1) and check for loss of electrolytes.

- If low, notify Field Maintenance.
- Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
ENGINE IS HARD TO START OR TURNS OVER SLOWLY

INITIAL SETUP:

References
WP 0198

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

ENGINE IS HARD TO START OR TURNS OVER SLOWLY

MALFUNCTION

BATTERIES ARE UNSERVICEABLE

CORRECTIVE ACTION

Check battery voltage indicator reading on engine control panel (Figure 1, Item 1).

- If reading is not 12-14 V dc, notify Field Maintenance.
- If reading is 12-14 V dc, notify Field Maintenance.
- Verify problem is solved.

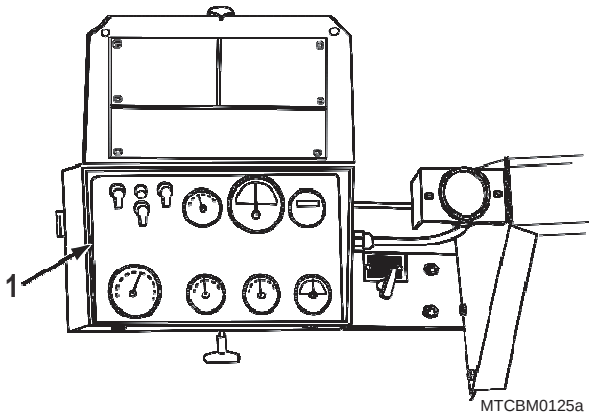


Figure 1. Engine Control Panel.

MALFUNCTION

LOOSE OR CORRODED BATTERY CABLE TERMINALS

CORRECTIVE ACTION

Remove battery cover and check for corroded or loose cable terminals (Figure 2, Item 2).

- Tighten and clean any loose or corroded battery terminals.
- Verify problem is solved.

MALFUNCTION

LOW ELECTROLYTES

CORRECTIVE ACTION

WARNING

Do not attempt to jump-start engine. Jump-starting may result in damage to batteries or serious fire hazard. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Remove vent fill caps (Figure 2, Item 1) and check for loss of electrolytes.

- If low, notify Field Maintenance.
- Verify problem is solved.

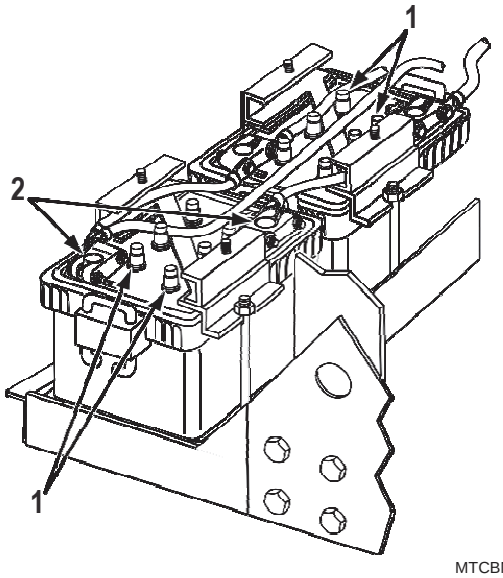


Figure 2. Batteries.

MALFUNCTION

ENGINE AIR CLEANER IS CLOGGED

CORRECTIVE ACTION

Check air cleaner restriction indicator for red band.

- If red band is showing, service engine air cleaner (WP 0198).
- Verify problem is solved.

MALFUNCTION

FUEL LINES OR CONNECTIONS ARE LOOSE OR DAMAGED

CORRECTIVE ACTION

Inspect fuel lines for damage and loose connections.

- If any loose connections or damaged fuel lines are found, notify Field Maintenance.
- Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
ENGINE TURNS OVER BUT FAILS TO START

INITIAL SETUP:

References
WP 0198

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

ENGINE TURNS OVER BUT FAILS TO START

MALFUNCTION

FUEL IS LOW

CORRECTIVE ACTION

Remove fuel cap from tank and check fuel level.

- If fuel level is low, add fuel.
- Verify problem is solved.

MALFUNCTION

FUEL STOP SOLENOID DOES NOT MOVE UP AND DOWN

CORRECTIVE ACTION

NOTE

- Engine switch energizes and de-energizes fuel stop solenoid, causing solenoid piston to move up and down.
- If engine is overheated, high temperature switch opens and de-energizes fuel stop solenoid, stopping the engine.

Check fuel stop solenoid to ensure it functions properly.

- Observe position and then set engine switch to run.
- Recheck fuel stop solenoid position.
- Set engine switch to stop.
- If fuel stop solenoid does not move up and down, notify Field Maintenance.
- Verify problem is solved.

MALFUNCTION

LOW ELECTROLYTES

CORRECTIVE ACTION

WARNING

Do not attempt to jump-start engine. Jump-starting may result in damage to batteries or serious fire hazard. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Remove vent fill caps (Figure 1, Item 1) and check for loss of electrolytes.

- If low, notify Field Maintenance.
- Verify problem is solved.

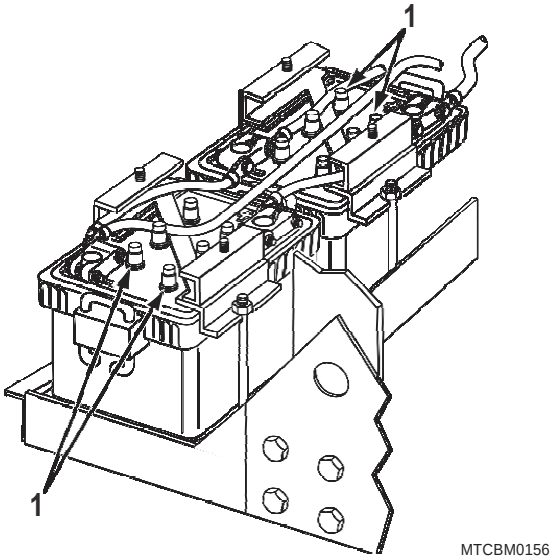


Figure 1. Batteries.

MALFUNCTION

ENGINE AIR CLEANER IS CLOGGED

CORRECTIVE ACTION

Check air cleaner restriction indicator for red band.

- If red band is showing, service engine air cleaner (WP 0198).
- Verify problem is solved.

MALFUNCTION

FUEL LINES OR CONNECTIONS ARE LOOSE OR DAMAGED

CORRECTIVE ACTION

Inspect fuel lines for damage and loose connections.

- If any loose connections or damaged fuel lines are found, notify Field Maintenance.
- Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
ENGINE MISFIRES AT HEAVY LOAD OR ENGINE POWER IS LOW

INITIAL SETUP:

References
WP 0198

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

ENGINE MISFIRES AT HEAVY LOAD OR ENGINE POWER IS LOW

MALFUNCTION

ENGINE AIR CLEANER IS CLOGGED

CORRECTIVE ACTION

Check air cleaner restriction indicator gage (Figure 1, Item 1) for red band.

- If red band is showing, service engine air cleaner (WP 0198).
- Verify problem is solved.

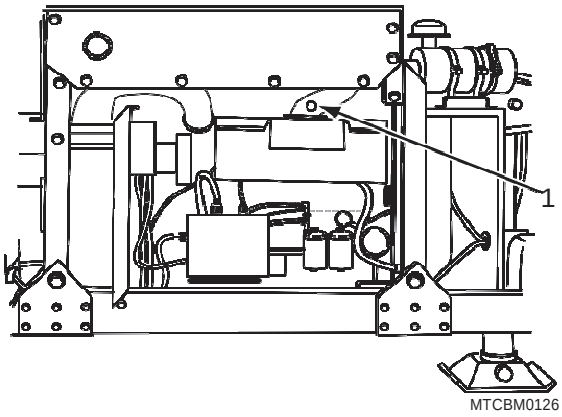


Figure 1. Air Cleaner Restriction Indicator Gage.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
LOW OIL PRESSURE IS INDICATED ON GAGE

INITIAL SETUP:

References
WP 0286

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

LOW OIL PRESSURE IS INDICATED ON GAGE

MALFUNCTION

ENGINE OIL LEVEL IS LOW

CORRECTIVE ACTION

With engine off, check engine oil level with dipstick.

- If oil level is low, fill to proper level (WP 0286).
- Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
LIGHTS ON SEMITRAILER INOPERABLE

INITIAL SETUP:

Equipment Condition
Semitrailer coupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

LIGHTS ON SEMITRAILER INOPERABLE

MALFUNCTION

LIGHT SWITCH IN PRIME MOVER NOT IN CORRECT POSITION

CORRECTIVE ACTION

1. If switch is in wrong position, place in proper position (See Operator's Manual for Prime Mover).
2. Verify problem is solved.

MALFUNCTION

FUSE IN PRIME MOVER IS BLOWN

CORRECTIVE ACTION

Inspect fuse in Prime Mover.

- If fuse is blown, notify Field Maintenance.
- Verify problem is solved.

MALFUNCTION

INTERVEHICULAR CABLE IS NOT PROPERLY PLUGGED INTO RECEPTACLE OF SEMITRAILER AND PRIME MOVER

CORRECTIVE ACTION

1. Reconnect intervehicular cable properly (WP 0007).
2. Verify problem is solved.

MALFUNCTION

CORRODED RECEPTACLE OR INTERVEHICULAR PLUG

CORRECTIVE ACTION

1. If dirt or corrosion is found, clean receptacle and plug.
2. Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
ONE OR MORE LIGHTS (BUT NOT ALL) WILL NOT OPERATE, OR LIGHTS ARE DIM OR FLICKERING

INITIAL SETUP:

Equipment Condition
Engine off
(See Operator's Manual for Prime Mover)
Parking brake applied (WP 0007)

Equipment Condition (cont.)
Semitrailer coupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

ONE OR MORE LIGHTS (BUT NOT ALL) WILL NOT OPERATE, OR LIGHTS ARE DIM OR FLICKERING

MALFUNCTION

TAILLIGHTS OR MARKER LIGHTS UNSERVICEABLE

CORRECTIVE ACTION

1. If taillights or marker lights do not operate properly, notify Field Maintenance.
2. Verify problem is solved.

MALFUNCTION

INTERVEHICULAR CABLE PLUG OR RECEPTACLE IS DIRTY OR CORRODED

CORRECTIVE ACTION

1. If dirt or corrosion is found, clean receptacle and plug.
2. Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
CONTROL PANEL SECURE LIGHTING DOES NOT OPERATE

INITIAL SETUP:

Equipment Condition
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

CONTROL PANEL SECURE LIGHTING DOES NOT OPERATE

MALFUNCTION

BULB IS BURNED OUT

CORRECTIVE ACTION

1. If bulb is burned out, replace bulb.
2. If bulb is not burned out, notify Field Maintenance.
3. Verify problem is solved.

MALFUNCTION

BLOWN FUSE

CORRECTIVE ACTION

1. If blown fuse is found, replace fuse.
2. If no blown fuse is found, notify Field Maintenance.
3. Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
BRAKES WILL NOT APPLY OR WILL NOT RELEASE

INITIAL SETUP:

Equipment Condition
Semitrailer coupled (WP 0007)

TROUBLESHOOTING PROCEDURE

SYMPTOM

BRAKES WILL NOT APPLY OR WILL NOT RELEASE

MALFUNCTION

NO AIR FROM PRIME MOVER

CORRECTIVE ACTION

1. Check to see if air supply from Prime Mover is turned on.
   - If air supply is not turned on, turn on air supply (Refer to Operator's Manual for Prime Mover).
   - Verify problem is solved.
2. Check air pressure of Prime Mover.
   - If air pressure is low, build up air pressure to normal level (Refer to Operator's Manual for Prime Mover).
   - Verify problem is solved.

MALFUNCTION

LOOSE CONNECTION AT GLADHANDS

CORRECTIVE ACTION

1. If air lines are not connected properly, reconnect air lines properly (WP 0007)
2. Verify problem is solved.

MALFUNCTION

DIRTY PACKING IN GLADHANDS

CORRECTIVE ACTION

1. If packing is dirty, clean packing.
2. Verify problem is solved.

MALFUNCTION

DAMAGED OR LEAKING GLADHANDS

CORRECTIVE ACTION

1. If gladhands are damaged or leaking, notify Field Maintenance.
2. Verify problem is solved.

MALFUNCTION

DAMAGED BRAKE HOSES AND CONNECTORS

CORRECTIVE ACTION

1. If brake hoses and connectors are damaged or leaking, notify Field Maintenance.
2. Verify problem is solved.

MALFUNCTION

OPEN DRAINCOCKS

CORRECTIVE ACTION

1. If draincock(s) are open, close draincock(s).
2. Verify problem is solved.

MALFUNCTION

BRAKES WILL NOT APPLY

CORRECTIVE ACTION

1. If drain cocks are closed and brakes still do not apply or do not release, notify Field Maintenance.
2. Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
NO BRAKES OR BRAKES ARE WEAK

INITIAL SETUP:

Equipment Condition
Semitrailer coupled (WP 0007)

TROUBLESHOOTING PROCEDURE

SYMPTOM

NO BRAKES OR BRAKES ARE WEAK

MALFUNCTION

SHUT-OFF VALVES ARE NOT OPEN

CORRECTIVE ACTION

NOTE

Some Prime Movers are not equipped with shut-off valves.

1. If Prime Mover is equipped with shut-off valves, and valves are not open, open valves (refer to Operator's Manual for Prime Mover).
2. Verify problem is solved.

MALFUNCTION

COMPONENTS OF AIR BRAKE SYSTEM ARE LEAKING OR DAMAGED

CORRECTIVE ACTION

1. If any air brake system components are leaking or damaged, notify Field Maintenance.
2. If no damage or leaks are found, notify Field Maintenance.
3. Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
BRAKE APPLICATION OR RELEASE IS SLOW

INITIAL SETUP:

Equipment Condition
Semitrailer coupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

BRAKE APPLICATION OR RELEASE IS SLOW

MALFUNCTION

AIR BRAKE COMPONENTS ARE LEAKING OR DAMAGED

CORRECTIVE ACTION

1. If any leaks or damage are found, notify Field Maintenance.
2. Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
BRAKES GRAB

INITIAL SETUP:

Equipment Condition
Semitrailer coupled (WP 0007)

TROUBLESHOOTING PROCEDURE

SYMPTOM

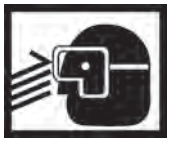
BRAKES GRAB

MALFUNCTION

MOISTURE PRESENT IN SEMITRAILER AIR RESERVOIRS

CORRECTIVE ACTION

WARNING



Particles blown by compressed air can be dangerous. Be certain to direct air stream away from the user and other personnel in the area. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Open drain valves to drain moisture from reservoirs.
2. If no moisture is present, notify Field Maintenance.
3. Verify problem is solved.

MALFUNCTION

END OF WORK PACKAGE

OPERATOR MAINTENANCE
FUEL DOES NOT FLOW DURING ANY NON-FILTERED FUELING OPERATION

INITIAL SETUP:

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

FUEL DOES NOT FLOW DURING ANY NON-FILTERED FUELING OPERATION

MALFUNCTION

EMERGENCY VALVE A CONTROL HANDLE IS NOT IN OPEN POSITION

CORRECTIVE ACTION

1. If valve is not in open position, open emergency valve A (Figure 1, Item 1) by operating control handle.

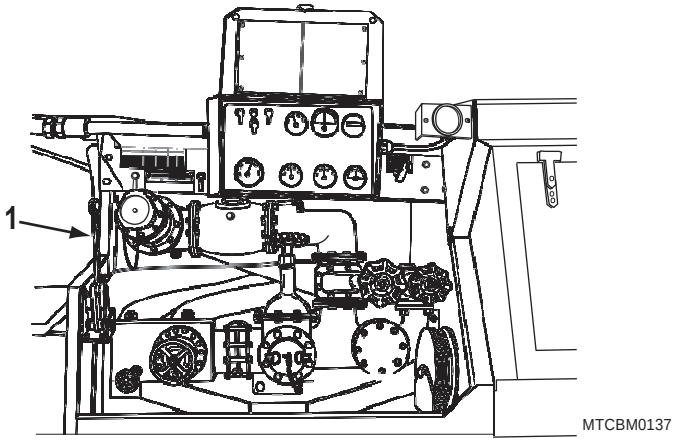


Figure 1. Emergency Valve A Control Handle.

2. If control does not operate, notify Field Maintenance.
3. Verify problem is solved.

MALFUNCTION

PROPER VALVES ARE NOT OPEN DURING FUELING OPERATION

CORRECTIVE ACTION

1. If proper valves are not open, open valves as required.
2. If proper valves are open, and fueling operation is not functioning, notify Field Maintenance.
3. Verify problem is solved.

MALFUNCTION

NOZZLE SCREEN CLOGGED WITH DIRT OR DEBRIS

CORRECTIVE ACTION

1. Clean or replace nozzle.
2. If no clog is found, notify Field Maintenance.
3. Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
FUEL DOES NOT FLOW DURING ANY FILTERED FUELING OPERATION

INITIAL SETUP:

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

FUEL DOES NOT FLOW DURING ANY FILTERED FUELING OPERATION

MALFUNCTION

EMERGENCY VALVE A CONTROL HANDLE IS NOT IN OPEN POSITION

CORRECTIVE ACTION

1. If emergency valve A (Figure 1, Item 1) is not in open position, open emergency valve A (Figure 1, Item 1) by operating control handle.
2. If control does not operate, notify Field Maintenance.
3. Verify problem is solved.

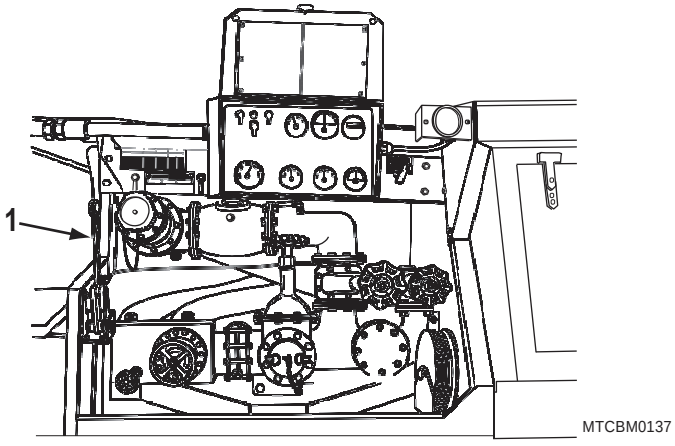


Figure 1. Emergency Valve A Control Handle.

MALFUNCTION

PROPER VALVES ARE NOT OPEN DURING FUELING OPERATION

CORRECTIVE ACTION

1. If proper valves are not open, open valves as required.
2. If proper valves are open, and fueling operation is not functioning, notify Field Maintenance.
3. Verify problem is solved.

MALFUNCTION

WATER PRESENT IN FILTER/SEPARATOR

CORRECTIVE ACTION

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

Open valve N and check for water in filter/separator.

- If water is present, drain filter/separator.
- Verify problem is solved.

MALFUNCTION

IMPROPER FILTER/SEPARATOR PRESSURE

CORRECTIVE ACTION

Check reading of filter/separator pressure gage (Figure 2, Item 2) on engine control panel (Figure 2, Item 1).

- If reading is above 18 psi (124.1 kPa), notify Field Maintenance.
- Verify problem is solved.

CORRECTIVE ACTION - Continued

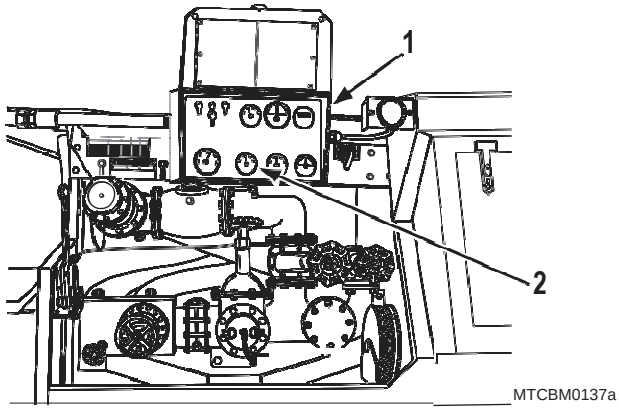


Figure 2. Filter/Separator Pressure Gage.

MALFUNCTION

NOZZLE IMPROPERLY CONNECTED OR FAULTY

CORRECTIVE ACTION

1. If fuel nozzle is improperly installed or faulty, notify Field Maintenance.
2. Verify problem is solved.

MALFUNCTION

NOZZLE SCREEN IS CLOGGED WITH DIRT OR DEBRIS

CORRECTIVE ACTION

1. Clean or replace nozzle screen.
2. If screen is not clogged, notify Field Maintenance.
3. Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
FUEL DOES NOT FLOW DURING ANY OVERWING FUELING OPERATION

INITIAL SETUP:

References
WP 0033

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Wheels chocked

TROUBLESHOOTING PROCEDURE

NOTE

Perform troubleshooting steps for FUEL DOES NOT FLOW DURING ANY FILTERED FUELING OPERATION (WP 0033) first.

SYMPTOM

FUEL DOES NOT FLOW DURING ANY OVERWING FUELING OPERATION

MALFUNCTION

NOZZLE SCREEN CLOGGED WITH DIRT OR DEBRIS

CORRECTIVE ACTION

1. Clean or replace screen.
2. If screen is not clogged, notify Field Maintenance.
3. Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
TIRES ARE EXCESSIVELY WORN, SCUFFED, OR CUPPED

INITIAL SETUP:

References
WP 0084

Equipment Condition
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

TIRES ARE EXCESSIVELY WORN, SCUFFED, OR CUPPED

MALFUNCTION

TIRES ARE IMPROPERLY INFLATED

CORRECTIVE ACTION

1. Inflate/deflate tires to 90 psi (620.6 kPa) for hard surface roads, or to 45 psi (310.3 kPa) for cross country.
2. Verify problem is solved.

MALFUNCTION

WHEEL(S) ARE LOOSE

CORRECTIVE ACTION

NOTE

When mission permits, notify Field Maintenance to torque wheel stud nuts.

1. Torque wheel stud nuts.
2. Verify problem is solved.

MALFUNCTION

WHEEL ASSEMBLY IS BENT OR DENTED

CORRECTIVE ACTION

1. Notify Field Maintenance.
2. Verify problem is solved.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
LANDING LEG CRANK IS DIFFICULT TO OPERATE

INITIAL SETUP:

Equipment Condition
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

LANDING LEG CRANK IS DIFFICULT TO OPERATE

MALFUNCTION

LOWER LEG IS BENT

CORRECTIVE ACTION

Inspect lower leg for bends.

- Notify Field Maintenance.
- Verify problem is solved.

MALFUNCTION

LANDING LEG WILL NOT RETURN TO ITS FULLY RETRACTED POSITION

CORRECTIVE ACTION

Turn landing leg crank and raise or lower landing leg.

- If lower leg does not fully retract, notify Field Maintenance.
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
NO SEMITRAILER LIGHTS WORKING

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer coupled (WP 0007)

References
WP 0100

TROUBLESHOOTING PROCEDURE

SYMPTOM

NO SEMITRAILER LIGHTS WORKING

MALFUNCTION

LOW OR NO VOLTAGE AT PRIME MOVER INTERVEHICULAR SOCKETS

CORRECTIVE ACTION

Turn on Prime Mover's service lights. Set multimeter at 30 V dc. Place red lead on socket pins of Prime Mover's intervehicular connector socket and ground black lead. Check multimeter reading.

- If reading shows low or no voltage, troubleshoot Prime Mover.
- Verify problem is solved.

MALFUNCTION

OPEN CIRCUIT IN INTERVEHICULAR CABLE CONNECTOR

CORRECTIVE ACTION

If voltage is present, hook up intervehicular cable connector. Set multimeter at 30 V dc. Place red lead on connector socket at semitrailer end of intervehicular cable and ground black lead. Check multimeter reading.

- If no voltage is present, replace intervehicular cable.
- Verify problem is solved.

MALFUNCTION

NO VOLTAGE AT JUNCTION BLOCK TERMINALS (M969A2)

CORRECTIVE ACTION

If voltage is present, open front cover (Figure 1, Item 5) of voltage reduction box (Figure 1, Item 4). Locate junction block (Figure 1, Item 1) on left side of box (Figure 1, Item 4). With power connected to semitrailer and using multimeter set at 30 V dc, place red lead (Figure 1, Item 2) on junction block terminals and ground black lead (Figure 1, Item 3). Check multimeter reading.

- Replace voltage reduction box (Figure 1, Item 4).
- Verify problem is solved.

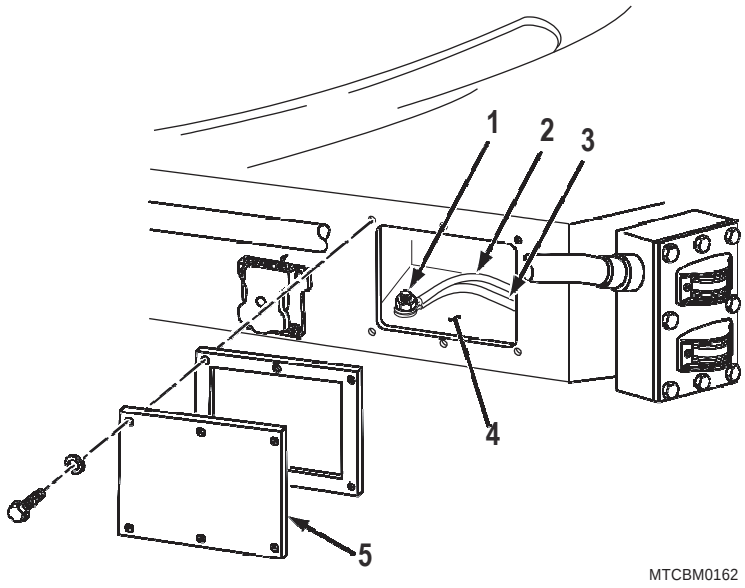


Figure 1. Front Cover.

MALFUNCTION

BROKEN WIRING HARNESS

CORRECTIVE ACTION

1. Replace wiring harness (WP 0100).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
ONE OR MORE CLEARANCE LIGHTS DO NOT WORK

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer coupled (WP 0007)

References
WP 0288

TROUBLESHOOTING PROCEDURE

SYMPTOM

ONE OR MORE CLEARANCE LIGHTS DO NOT WORK

MALFUNCTION

LIGHTS INOPERATIVE

CORRECTIVE ACTION

Check which lights do not work and compare to electrical wiring diagram (WP 0288).

- If lights are on the same circuit, proceed to SHORT CIRCUIT AT LAMP SOCKET.
- If lights are on different circuits, proceed to NO CONTINUITY AT BULB SOCKET.
- Verify problem is solved.

MALFUNCTION

NO CONTINUITY AT BULB

CORRECTIVE ACTION

Remove lens from any clearance light that does not work. Remove bulb from socket. Set multimeter for continuity testing. Place red lead on base terminal and black lead at side of light.

- If multimeter does not show continuity, replace bulb.
- Verify problem is solved.

MALFUNCTION

NO VOLTAGE AT FEEDER WIRE

CORRECTIVE ACTION

Open junction box for light. Set multimeter at 30 V dc. Probe red lead of multimeter into feeder wire and ground black lead.

CORRECTIVE ACTION - Continued

- If voltage is not present, replace feeder wire between light and main wiring harness.
- Verify problem is solved.

MALFUNCTION

SHORT CIRCUIT AT LAMP SOCKET

CORRECTIVE ACTION

Open junction box for light. Set multimeter at 30 V dc. Probe red lead of multimeter into feeder wire and ground black lead.

- If voltage is present, replace lamp socket.
- Verify problem is solved.

MALFUNCTION

SHORT CIRCUIT AT INTERVEHICULAR CABLE CONNECTOR

CORRECTIVE ACTION

Unhook intervehicular cable connector. Using multimeter set at 30 V dc, place red lead on pin in intervehicular cable connector that connects to circuit with nonworking lights and place black lead on good ground on Prime Mover.

- If voltage is present, replace voltage reduction box.
- Verify problem is solved.

MALFUNCTION

NO VOLTAGE PRESENT AT PRIME MOVER INTERVEHICULAR CABLE

CORRECTIVE ACTION

Set multimeter to 30 V dc. At intervehicular cable socket of Prime Mover, place red lead on pin for bad circuit and ground black lead.

- If no voltage is present, troubleshoot Prime Mover (refer to Maintenance Manual for Prime Mover).
- Verify problem is solved.

MALFUNCTION

OPEN CIRCUIT AT INTERVEHICULAR CABLE

CORRECTIVE ACTION

Set multimeter at 30 V dc. At intervehicular cable socket of Prime Mover, place red lead on pin for bad circuit and ground black lead.

- If voltage is present, replace intervehicular cable (refer to Maintenance Manual for Prime Mover).
- Verify problem is solved.

MALFUNCTION

SHORT CIRCUIT AT VOLTAGE REDUCTION BOX JUNCTION BLOCK (M969A2)

CORRECTIVE ACTION

Open front cover of voltage reduction box. Locate harness junction block. With power connected to semitrailer and using multimeter set at 30 V dc, place red lead on junction block terminals (refer to wiring diagram (WP 0288)), and ground black lead.

- If voltage is present, replace bad circuit.
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
STOPLIGHTS DO NOT WORK

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer coupled (WP 0007)

Personnel Required
Two

TROUBLESHOOTING PROCEDURE

SYMPTOM

STOPLIGHTS DO NOT WORK

MALFUNCTION

STOPLIGHTS INOPERATIVE

CORRECTIVE ACTION

Check to see if both stoplights are inoperative.

- If both lights are not working, proceed to SHORT CIRCUIT AT LIGHT ASSEMBLY.

MALFUNCTION

NO CONTINUITY AT BULB

CORRECTIVE ACTION

Remove lens from any light that does not work. Remove bulb from socket. Set multimeter for continuity testing. Place red lead on base terminal and black lead at side of light.

- If multimeter does not show continuity, replace bulb.
- Verify problem is solved.

MALFUNCTION

NO VOLTAGE AT LIGHT ASSEMBLY

CORRECTIVE ACTION

Remove light body from semitrailer. Set multimeter to 30 V dc. Probe red lead of multimeter on red circuit wire and ground black lead while assistant applies brakes.

- If voltage is not present, replace red wire between stoplight and junction box.
- Verify problem is solved.

MALFUNCTION

SHORT CIRCUIT AT LIGHT ASSEMBLY

CORRECTIVE ACTION

Remove light body from semitrailer. Set multimeter to 30 V dc. Probe red lead of multimeter on red circuit wire and ground black lead while assistant applies brakes.

- If voltage is present, replace light assembly.
- Verify problem is solved.

MALFUNCTION

NO VOLTAGE PRESENT AT INTERVEHICULAR CABLE SOCKET

CORRECTIVE ACTION

Set multimeter to 30 V dc. At intervehicular cable socket on Prime Mover, place red lead on pin of bad circuit and ground black lead.

- If no voltage is present, troubleshoot Prime Mover (Refer to Maintenance Manual for Prime Mover).
- Verify problem is solved.

MALFUNCTION

SHORT CIRCUIT AT INTERVEHICULAR CABLE CONNECTOR

CORRECTIVE ACTION

Set multimeter to 30 V dc. At intervehicular cable socket on Prime Mover, place red lead on pin for bad circuit and ground black lead.

- If voltage is present, replace intervehicular cable connector (Refer to maintenance manual for Prime Mover).
- Verify problem is solved.

MALFUNCTION

SHORT CIRCUIT AT JUNCTION BLOCK (M969A2)

CORRECTIVE ACTION

Remove cover from voltage reduction box. Connect intervehicular cable to socket. With multimeter set at 30 V dc, place red lead on terminal for red harness wire on junction block and ground black lead while assistant applies brakes.

- If voltage is present, replace red wire from voltage reduction box to junction box.
- Verify problem is solved.

MALFUNCTION

SHORT CIRCUIT IN VOLTAGE REDUCTION BOX (M969A2)

CORRECTIVE ACTION

Disconnect intervehicular cable connector. Using multimeter set at 30 V dc, place red lead on pin for bad circuit, and place black lead on good ground on Prime Mover.

- If voltage is present, replace voltage reduction box.
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
TURN SIGNAL LIGHTS DO NOT WORK

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer coupled (WP 0007)
Wheels chocked

Personnel Required
Two

References
WP 0094
WP 0288

TROUBLESHOOTING PROCEDURE

SYMPTOM

TURN SIGNAL LIGHTS DO NOT WORK

MALFUNCTION

TURN SIGNAL LIGHTS INOPERATIVE

CORRECTIVE ACTION

If both lights are not working, proceed to SHORT CIRCUIT AT BROWN OR WHITE WIRE IN JUNCTION BLOCK.

MALFUNCTION

LAMP IS BURNED OUT

CORRECTIVE ACTION

Remove lens from light that does not work. Using multimeter set for continuity testing, place red lead on base terminal and black lead on side of lamp.

- If multimeter does not show continuity, replace bulb (WP 0094).
- Verify problem is solved.

MALFUNCTION

SHORT CIRCUIT AT LIGHT BODY WITH BRAKES APPLIED

CORRECTIVE ACTION

Remove light body from semitrailer (Refer to wiring diagram) (WP 0288). Using multimeter set at 30 V dc, probe red lead of multimeter on brown or white wire and ground black lead while assistant applies brakes.

- If voltage is present, replace light assembly (WP 0094).
- Verify problem is solved.

MALFUNCTION

FAULT IN PRIME MOVER

CORRECTIVE ACTION

Set multimeter to 30 V dc. At intervehicular cable socket on Prime Mover, place red lead on two pins for turn signals and ground black lead.

- If no voltage is present, troubleshoot Prime Mover (Refer to Maintenance Manual for Prime Mover).
- Verify problem is solved.

MALFUNCTION

SHORT CIRCUIT AT INTERVEHICULAR CABLE

CORRECTIVE ACTION

Set multimeter to 30 V dc. At intervehicular cable socket on Prime Mover, place red lead on two pins for turn signals and ground black lead.

- If voltage is present, replace intervehicular cable (Refer to Maintenance Manual for Prime Mover).
- Verify problem is solved.

MALFUNCTION

SHORT CIRCUIT AT BROWN OR WHITE WIRE IN JUNCTION BLOCK (M969A2)

CORRECTIVE ACTION

Remove cover from voltage reduction box. Connect intervehicular cable to terminal. With multimeter set at 30 V dc, place red lead on terminal for white or brown harness wire on junction block and ground black lead while assistant applies brakes (Refer to wiring diagram) (WP 0288).

- If voltage is present, replace brown or white wire from voltage reduction box to left or right turn signal.
- Verify problem is solved.

MALFUNCTION

SHORT CIRCUIT AT VOLTAGE REDUCTION BOX (M969A2)

CORRECTIVE ACTION

Disconnect intervehicular cable connector. Using multimeter set at 30 V dc, place red lead on two pins for turn signals and place black lead on good ground on Prime Mover while assistant applies brakes.

- If voltage is present on both pins, replace voltage reduction box.
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
BATTERY CHARGE IS LOW

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0097
WP 0098

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked
Batteries disconnected

TROUBLESHOOTING PROCEDURE

WARNING

- Batteries produce explosive gases. Keep sparks, flame, and smoking material away. Ventilate when charging or using in an enclosed space. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Batteries contain sulfuric acid that causes severe burns. If acid contacts eyes, skin, or clothing, flush well with water. For contact with eyes, get immediate medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

SYMPTOM

BATTERY CHARGE IS LOW

MALFUNCTION

BATTERY SPECIFIC GRAVITY LOW

CORRECTIVE ACTION

Check specific gravity of the electrolyte to determine the approximate state of charge of the batteries.

- If specific gravity is low, recharge batteries.
- Verify problem is solved.

MALFUNCTION

BATTERY CABLES ARE FRAYED OR BROKEN

CORRECTIVE ACTION

1. Replace cable(s) (WP 0098).
2. Verify problem is solved.

MALFUNCTION

ELECTROLYTES LOW IN BATTERY

CORRECTIVE ACTION

1. Service batteries.
2. Verify problem is solved.

MALFUNCTION

BATTERY TERMINAL LUGS BROKEN

CORRECTIVE ACTION

1. Replace battery (WP 0097).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
BATTERY IS DISCHARGED

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

References
WP 0096
WP 0097

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

WARNING

- Batteries produce explosive gases. Keep sparks, flame, and smoking material away. Ventilate when charging or using in an enclosed space. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Batteries contain sulfuric acid that causes severe burns. If acid contacts eyes, skin, or clothing, flush well with water. For contact with eyes, get immediate medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

SYMPTOM

BATTERY IS DISCHARGED

MALFUNCTION

TOP OF BATTERY IS COVERED WITH DIRT OR ELECTROLYTES

CORRECTIVE ACTION

1. If dirt or electrolytes are found, clean batteries (WP 0096).
2. If no dirt or electrolytes are found, replace batteries (WP 0097).
3. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
UNDERCHARGED BATTERIES

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0096
WP 0217
WP 0218

References (cont.)
WP 0222
WP 0097

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

WARNING

- Batteries produce explosive gases. Keep sparks, flame, and smoking material away. Ventilate when charging or using in an enclosed space. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Batteries contain sulfuric acid that causes severe burns. If acid contacts eyes, skin, or clothing, flush well with water. For contact with eyes, get immediate medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

SYMPTOM

UNDERCHARGED BATTERIES

MALFUNCTION

MOISTURE IS PRESENT ON TOP OF BATTERIES

CORRECTIVE ACTION

1. Clean batteries (WP 0097).
2. Verify problem is solved.

MALFUNCTION

BATTERY TERMINALS AND CONNECTIONS LOOSE OR CORRODED

CORRECTIVE ACTION

1. Tighten and clean terminals (WP 0096).
2. Verify problem is solved.

MALFUNCTION

SPECIFIC GRAVITY IS LOW

CORRECTIVE ACTION

1. Replace batteries (WP 0097).
2. Verify problem is solved.

MALFUNCTION

ALTERNATOR DRIVE PULLEY IS WORN OR LOOSE

CORRECTIVE ACTION

1. Replace alternator drive pulley (WP 0217).
2. Verify problem is solved.

MALFUNCTION

ALTERNATOR DRIVE BELT IS LOOSE OR DAMAGED

CORRECTIVE ACTION

1. Tighten or replace alternator belt (WP 0218).
2. Verify problem is solved.

MALFUNCTION

ALTERNATOR POSITIVE OR NEGATIVE OUTPUT TERMINALS ARE CORRODED OR HAVE LOOSE CONNECTIONS

CORRECTIVE ACTION

1. If output terminals are loose, tighten terminals (WP 0217).
2. If output terminals are corroded, clean terminals (WP 0217).
3. Verify problem is solved.

MALFUNCTION

BUSS BAR ASSEMBLY CONNECTIONS OR GROUND WIRE #3 ON ENGINE IS LOOSE

CORRECTIVE ACTION

1. If any loose connections are found, tighten connections (WP 0222).
2. Verify problem is solved.

MALFUNCTION

ALTERNATOR HAS LOW OUTPUT

CORRECTIVE ACTION

1. Replace alternator (WP 0217).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
OVERCHARGED BATTERIES (INDICATED BY HIGH WATER USAGE)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0096

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

WARNING

- Batteries produce explosive gases. Keep sparks, flame, and smoking material away. Ventilate when charging or using in an enclosed space. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Batteries contain sulfuric acid that causes severe burns. If acid contacts eyes, skin, or clothing, flush well with water. For contact with eyes, get immediate medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

SYMPTOM

OVERCHARGED BATTERIES (INDICATED BY HIGH WATER USAGE)

MALFUNCTION

BATTERY CASE IS CRACKED OR DAMAGED

CORRECTIVE ACTION

1. Replace battery (WP 0096).
2. Verify problem is solved.

MALFUNCTION

BATTERIES ARE UNSERVICEABLE

CORRECTIVE ACTION

Perform specific gravity test on batteries.

- If specific gravity is not within the proper range, replace batteries (WP 0096).
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
BRAKES DO NOT RELEASE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Parking brake applied
(See Operator's Manual for Prime Mover)
Semitrailer coupled (WP 0007)

References
WP 0120
WP 0121
WP 0132
WP 0133

TROUBLESHOOTING PROCEDURE

SYMPTOM

BRAKES DO NOT RELEASE

MALFUNCTION

AIR HOSE HAS POOR CONNECTION

CORRECTIVE ACTION

1. Connect air hoses properly (WP 0133).
2. Verify problem is solved.

MALFUNCTION

INCORRECT POSITION OF BRAKE VALVE

CORRECTIVE ACTION

1. Move brake valve to release position.
2. Verify problem is solved.

MALFUNCTION

RESTRICTION IN SERVICE AND EMERGENCY AIR HOSES

CORRECTIVE ACTION

1. Replace as required (WP 0133).
2. Verify problem is solved.

MALFUNCTION

SHUT-OFF VALVE CLOSED ON PRIME MOVER

CORRECTIVE ACTION

NOTE

Some Prime Movers are not equipped with shut-off valves.

Check for closed shut-off valves on Prime Mover.

- If Prime Mover is equipped with shut-off valves, and valves are not closed, open shut-off valves (Refer to Maintenance Manual for Prime Mover).
- Verify problem is solved.

MALFUNCTION

DEFECTIVE RELAY EMERGENCY VALVE AND/OR MULTIFUNCTION VALVE

CORRECTIVE ACTION

1. If either/both valve(s) is defective, replace defective valve(s) (WP 0132).
2. Verify problem is solved.

MALFUNCTION

WEAK OR BROKEN BRAKE SHOE TENSION SPRING

CORRECTIVE ACTION

NOTE

Some Prime Movers are not equipped with shut-off valves.

If Prime Mover is equipped with shut-off valves, and valves are not closed, check for weak or broken brake shoe tension spring.

- Replace weak or broken brake shoe tension spring (WP 0120) or (WP 0121).
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
NO BRAKES OR BRAKES ARE WEAK

INITIAL SETUP:

References
WP 0118
WP 0120
WP 0121
WP 0124
WP 0132

Equipment Condition
Parking brake applied
(See Operator's Manual for Prime Mover)

Equipment Condition (cont.)
Semitrailer coupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

NO BRAKES OR BRAKES ARE WEAK

MALFUNCTION

AIR BRAKE CHAMBER LEAKING

CORRECTIVE ACTION

1. Replace air brake chambers (WP 0124).
2. Verify problem is solved.

MALFUNCTION

GREASE PRESENT ON BRAKE SHOES

CORRECTIVE ACTION

1. Replace brake shoes (WP 0120) or (WP 0121).
2. Verify problem is solved.

MALFUNCTION

BRAKES ARE WORN

CORRECTIVE ACTION

Inspect brake shoes to ensure they are not within 0.063 in. (0.160 cm) of rivet heads.

- If less than 0.063 in. (0.160 cm), replace brake shoes (WP 0120) or (WP 0121).
- Verify problem is solved.

MALFUNCTION

EMERGENCY RELAY VALVE NOT FUNCTIONING

CORRECTIVE ACTION

Check for air leakage.

- If air leak present, replace emergency relay valve (WP 0132).
- Verify problem is solved.

MALFUNCTION

BRAKE ACTUATING CAMSHAFT IS LOOSE, WORN, OR DAMAGED

CORRECTIVE ACTION

1. Replace camshaft (WP 0118).
2. Verify problem is solved.

MALFUNCTION

FAULT IN PRIME MOVER

CORRECTIVE ACTION

If fault is still present, troubleshoot Prime Mover (See Maintenance Manual for Prime Mover).

- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
BRAKES ARE SLOW TO APPLY OR RELEASE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0120
WP 0121
WP 0124
WP 0125

References (cont.)
WP 0132
WP 0133

Equipment Condition
Parking brake applied
(See Operator's Manual for Prime Mover)
Semitrailer coupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

BRAKES ARE SLOW TO APPLY OR RELEASE

MALFUNCTION

LOW AIR PRESSURE

CORRECTIVE ACTION

Check air lines and connectors for leaks and restrictions.

- Tighten connections.
- Remove any restrictions from hoses.
- Replace air hoses and connectors as necessary (WP 0133).
- Verify problem is solved.

MALFUNCTION

EMERGENCY RELAY VALVE NOT OPERATIONAL

CORRECTIVE ACTION

1. Replace emergency relay valve (WP 0132).
2. Verify problem is solved.

MALFUNCTION

WEAK OR BROKEN BRAKE SHOE TENSION SPRING

CORRECTIVE ACTION

1. Replace brake shoe tension spring (WP 0120) or (WP 0121).
2. Verify problem is solved.

MALFUNCTION

DEFECTIVE AIR BRAKE CHAMBERS

CORRECTIVE ACTION

Check operation of air brake chambers.

- Replace air brake chambers (WP 0124) or (WP 0125).
- Verify problem is solved.

MALFUNCTION

FROZEN OR BROKEN S CAMSHAFT ROLLER

CORRECTIVE ACTION

1. Replace S camshaft roller (WP 0124).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
BRAKES GRAB

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0118
WP 0120
WP 0121

References (cont.)
WP 0135
WP 0136

Equipment Condition
Parking brake applied
(See Operator's Manual for Prime Mover)
Semitrailer coupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

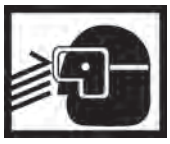
BRAKES GRAB

MALFUNCTION

MOISTURE IN AIR RESERVOIRS

CORRECTIVE ACTION

WARNING



Particles blown by compressed air can be dangerous. Be certain to direct air stream away from the user and other personnel in the area. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Open drain cocks to drain moisture from air reservoirs.
2. Verify problem is solved.

MALFUNCTION

BRAKES ARE OUT OF ADJUSTMENT

CORRECTIVE ACTION

1. Adjust brakes (WP 0120) or (WP 0121).
2. Verify problem is solved.

MALFUNCTION

GREASE PRESENT ON BRAKE LININGS

CORRECTIVE ACTION

1. Replace brake shoes (WP 0120) or (WP 0121).
2. Verify problem is solved.

MALFUNCTION

WHEEL BEARINGS ARE LOOSE OR WORN

CORRECTIVE ACTION

1. Replace wheel bearings (WP 0135) or (WP 0136).
2. Verify problem is solved.

MALFUNCTION

BRAKE LININGS ARE LOOSE OR WORN

CORRECTIVE ACTION

1. Replace brake shoes (WP 0120) or (WP 0121).
2. Verify problem is solved.

MALFUNCTION

BRAKE DRUMS ARE CRACKED, SCORED, OR WORN

CORRECTIVE ACTION

1. Replace brake drum(s) (WP 0135) or (WP 0136).
2. Verify problem is solved.

MALFUNCTION

S CAMSHAFT ROLLER IS BROKEN OR FROZEN

CORRECTIVE ACTION

Visually check for broken or frozen S camshaft roller.

- If S camshaft roller is broken or frozen, replace S camshaft roller (WP 0118).
- Verify problem is solved.

MALFUNCTION

BACKING PLATE IS DAMAGED OR LOOSE

CORRECTIVE ACTION

Check backing plate for damage or looseness.

- If backing plate is damaged or loose, replace backing plate (WP 0118).
- Verify problem is solved.

MALFUNCTION

FAULT IN PRIME MOVER

CORRECTIVE ACTION

If fault is still present, troubleshoot Prime Mover (See Maintenance Manual for Prime Mover).

- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
BRAKES DO NOT APPLY

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Personnel Required
Two

References
WP 0084
WP 0118
WP 0120
WP 0121
WP 0122

References (cont.)
WP 0124
WP 0125
WP 0132
WP 0133
WP 0135
WP 0136

Equipment Condition
Parking brake applied (WP 0007)
Semitrailer coupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

BRAKES DO NOT APPLY

MALFUNCTION

SHUT-OFF VALVE OF PRIME MOVER IS CLOSED

CORRECTIVE ACTION

NOTE

Some Prime Movers are not equipped with shut-off valves.

1. If Prime Mover is equipped with shut-off valves, and valves are closed, open valve (see Operator's Manual for Prime Mover).
2. Verify problem is solved.

MALFUNCTION

AIR LEAKS AT GLADHANDS

CORRECTIVE ACTION

Check service and emergency gladhands for damage or leaks by listening for hissing sound or by using a mild soap solution and watching for bubbles.

- Clean gladhands and replace packing or replace gladhand(s) (see Operator's Manual for Prime Mover).
- Verify problem is solved.

MALFUNCTION

AIR LEAKS AT AIR RESERVOIRS

CORRECTIVE ACTION

Check air reservoir draincocks.

- If open, close draincocks.
- Verify problem is solved.

MALFUNCTION

EMERGENCY RELAY VALVE IS DAMAGED OR LEAKING

CORRECTIVE ACTION

Check emergency relay valve (WP 0132) for damage or leaks by listening for hissing sound or by using a mild soap solution and watching for bubbles.

- Replace emergency relay valve (WP 0132).
- Verify problem is solved.

MALFUNCTION

AIR HOSES OR FITTINGS ARE DAMAGED

CORRECTIVE ACTION

Check emergency and service hoses and fittings from gladhands to air reservoir for damage or leaks by listening for hissing sound or by using mild soap solution and watching for bubbles.

- Replace hoses (WP 0133).
- Verify problem is solved.

MALFUNCTION

SLACK ADJUSTERS AND/OR S CAMSHAFTS ARE DAMAGED

CORRECTIVE ACTION

Have assistant apply brakes in Prime Mover. Check slack adjusters and/or S camshafts for damage.

- Replace slack adjusters (WP 0122) and/or S camshaft (WP 0118).
- Verify problem is solved.

MALFUNCTION

BRAKE SHOES ARE DAMAGED, GREASY, OR OILY

CORRECTIVE ACTION

Remove tire and wheel assembly (WP 0084) and hub and brake drum (WP 0132) or (WP 0136) from axle. Check brake shoes for damage, grease, or oil on surface.

- Replace brake shoes (WP 0120) or (WP 0121).
- Verify problem is solved.

MALFUNCTION

BRAKE DRUMS ARE DAMAGED

CORRECTIVE ACTION

1. Replace brake drum (WP 0135) or (WP 0136).
2. Verify problem is solved.

MALFUNCTION

AIR BRAKE CHAMBER IS DAMAGED OR LEAKS

CORRECTIVE ACTION

Check air brake chamber for damage or leaks by listening for hissing sound or by using a mild soap solution and watching for bubbles.

- Replace air brake chamber (WP 0124) or (WP 0125).
- Verify problem is solved.

MALFUNCTION

AIR HOSES AND/OR FITTINGS LEAK

CORRECTIVE ACTION

Check fittings and hose from air brake chamber to emergency relay valve for damage or leaks by listening for hissing sound or by using a mild soap solution and watching for bubbles.

- Replace hose and/or fittings (WP 0133).
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
RAPID BRAKE LINING WEAR

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0119
WP 0120

Equipment Condition
Hub and drum assembly removed
(WP 0135) (WP 0136)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

RAPID BRAKE LINING WEAR

MALFUNCTION

INCORRECT BRAKE LININGS USED

CORRECTIVE ACTION

1. Replace with correct linings (WP 0119) or (WP 0120).
2. Verify problem is solved.

MALFUNCTION

BRAKE DRUM IS UNSERVICEABLE

CORRECTIVE ACTION

Inspect brake drum for scoring, cracks, or uneven wear.

- If brake drum is cracked, scored, or badly damaged, replace drum (WP 0135) or (WP 0136).
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
TIRES ARE EXCESSIVELY WORN, CUPPED, OR SCUFFED

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0048
WP 0084
WP 0115

Equipment Condition
Parking brake applied (WP 0007)

Equipment Condition (cont.)
Semitrailer coupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

TIRES ARE EXCESSIVELY WORN, CUPPED, OR SCUFFED

MALFUNCTION

BENT WHEEL

CORRECTIVE ACTION

1. Replace wheel (WP 0084).
2. Verify problem is solved.

MALFUNCTION

FRONT OR REAR AXLE HAS BAD TIRE(S)

CORRECTIVE ACTION

Check to see which axle has a bad tire(s).

- If the tire is bad, proceed to MISSING, DAMAGED, OR LOOSE MOUNTING HARDWARE.

MALFUNCTION

MISSING, DAMAGED, OR LOOSE MOUNTING HARDWARE

CORRECTIVE ACTION

Check axle of bad tire for damaged, missing, or loose bolts or screws in mounting hardware.

- If there are any missing, damaged, or loose hardware, tighten or replace necessary hardware (WP 0084).
- Verify problem is solved.

MALFUNCTION

BENT OR DAMAGED AXLE

CORRECTIVE ACTION

1. Replace axle (WP 0115).
2. Verify problem is solved.

MALFUNCTION

BRAKES GRAB

CORRECTIVE ACTION

Troubleshoot brake system (WP 0048).

END OF WORK PACKAGE

FIELD MAINTENANCE
LANDING GEAR IS DIFFICULT TO RAISE OR LOWER

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0118

References (cont.)
WP 0140
WP 0141

Equipment Condition
Semitrailer uncoupled (WP 0007)

TROUBLESHOOTING PROCEDURE

SYMPTOM

LANDING GEAR IS DIFFICULT TO RAISE OR LOWER

MALFUNCTION

MISALIGNED OR DAMAGED LANDING GEAR LEG

CORRECTIVE ACTION

Replace landing leg (WP 0140).

MALFUNCTION

BENT SHAFT OR SHEARED RETAINING PINS

CORRECTIVE ACTION

1. If shaft is bent, replace shaft (WP 0118).
2. If retaining pins are sheared, replace retaining pins (WP 0141).

MALFUNCTION

UNSERVICEABLE GEARBOX

CORRECTIVE ACTION

Replace landing gear (WP 0140) or (WP 0141).

END OF WORK PACKAGE

FIELD MAINTENANCE
EXCESSIVE LEAKAGE AROUND MANHOLE COVER

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

References
WP 0166

Equipment Condition
Parking brake applied (WP 0007)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

EXCESSIVE LEAKAGE AROUND MANHOLE COVER

MALFUNCTION

MANHOLE COVER IS IMPROPERLY CLOSED OR LATCHED

CORRECTIVE ACTION

1. Close and latch manhole and fill cover.
2. Verify problem is solved.

MALFUNCTION

MANHOLE COVER HINGE, GASKET, OR LATCH IS DAMAGED

CORRECTIVE ACTION

1. Replace damaged part(s) (WP 0166).
2. Verify problem is solved.

MALFUNCTION

MANHOLE CLAMPING RING LOOSE OR DAMAGED GASKET

CORRECTIVE ACTION

1. If loose, tighten clamping ring (WP 0166).
2. If gasket is damaged, replace gasket (WP 0166).
3. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
STARTER MOTOR DOES NOT TURN ON OR HIGH CURRENT DRAW

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0219

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

STARTER MOTOR DOES NOT TURN OR HIGH CURRENT DRAW

MALFUNCTION

STARTER COMPONENT(S) GROUNDED

CORRECTIVE ACTION

Check starter switch and terminals for proper ground.

- If components are grounded, replace starter (WP 0219).
- Verify problem is solved.

MALFUNCTION

ARMATURE SHAFT BUSHING FROZEN

CORRECTIVE ACTION

WARNING

When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Check for frozen armature shaft bushings.

- If bushings are frozen, replace starter (WP 0219).
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
STARTER MOTOR DOES NOT TURN OR NO CURRENT DRAW

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0219

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

STARTER DOES NOT TURN OR NO CURRENT DRAW

MALFUNCTION

STARTER DOES NOT TURN

CORRECTIVE ACTION

1. Replace starter (WP 0219).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
SLOW STARTER SPEED

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0219

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

SLOW STARTER SPEED

MALFUNCTION

SLOW STARTER SPEED

CORRECTIVE ACTION

1. Replace starter (WP 0219).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
STARTER WILL NOT ENGAGE FLYWHEEL

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

References
WP 0219

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

STARTER WILL NOT ENGAGE FLYWHEEL

MALFUNCTION

STARTER CLUTCH (BENDIX) OR PINION IS UNSERVICEABLE

CORRECTIVE ACTION

1. If starter clutch (bendix) or pinion are not functioning properly, or are damaged, replace starter (WP 0219).
2. Verify problem is solved.

MALFUNCTION

FLYWHEEL DAMAGED

CORRECTIVE ACTION

1. If flywheel is damaged, replace flywheel (WP 0219).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
SHORT LIFE OF ALTERNATOR

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

References
WP 0217

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

TROUBLESHOOTING PROCEDURE

SYMPTOM

SHORT LIFE OF ALTERNATOR

MALFUNCTION

ALTERNATOR AND BATTERY CONNECTIONS ARE INCORRECT (REVERSE POLARITY)

CORRECTIVE ACTION

CAUTION

Reversing polarity will damage alternator. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. If polarity is reversed, even momentarily, replace alternator (WP 0217).
2. Verify problem is solved.

MALFUNCTION

ALTERNATOR IS DAMAGED OR DEFECTIVE

CORRECTIVE ACTION

1. Replace alternator (WP 0217).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE TURNS OVER BUT FAILS TO START

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0072
WP 0186
WP 0187
WP 0191
WP 0192
WP 0193

References (cont.)
WP 0195
WP 0202
WP 0203
WP 0210
WP 0220
WP 0221

Equipment Condition
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

ENGINE TURNS OVER BUT FAILS TO START

MALFUNCTION

AIR INTAKE FILTER IS CLOGGED OR DAMAGED

CORRECTIVE ACTION

Check air cleaner restriction indicator for display of red band and examine air filter for clogs or damage (WP 0195).

- If restriction indicator shows a red band or the air filter is clogged or damaged, replace filter element (WP 0195).
- Remove air cleaner intake cap and tube and clean as necessary.
- Verify problem is solved.

MALFUNCTION

FUEL LINES ARE LEAKING OR DAMAGED

CORRECTIVE ACTION

WARNING

- Make sure that grounding connections are made properly and firmly before any fueling operations begin so that grounding connections will not release. This will eliminate the possibility of static electricity creating sparks, which will ignite the fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- It is important that all fuel handling and operating procedures be followed precisely. A detailed study of FM 10-67-1 is essential for all fuel handling operations. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Tighten connections or replace any damaged fuel lines (WP 0202) or (WP 0203).
2. Verify problem is solved.

MALFUNCTION

FUEL PUMP(S) NOT FUNCTIONING PROPERLY

CORRECTIVE ACTION

WARNING

- Make sure that grounding connections are made properly and firmly before any fueling operations begin so that grounding connections will not release. This will eliminate the possibility of static electricity creating sparks, which will ignite the fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- It is important that all fuel handling and operating procedures be followed precisely. A detailed study of FM 10-67-1 is essential for all fuel handling operations. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

Disconnect fuel supply line to fuel filter head and crank engine to observe fuel flow from fuel line.

- If fuel does not flow from fuel line, replace fuel pump (WP 0193) or (WP 0192).
- Verify problem is solved.

MALFUNCTION

FUEL FILTER IS DIRTY OR CLOGGED

CORRECTIVE ACTION

1. Replace filter (WP 0210).
2. Verify problem is solved.

MALFUNCTION

ENGINE HIGH-TEMPERATURE CONTROL SWITCH IS DEFECTIVE (ONAN)

CORRECTIVE ACTION

1. Replace switch (WP 0221).
2. Verify problem is solved.

MALFUNCTION

ENGINE OIL PRESSURE SWITCH IS DEFECTIVE (LOMBARDINI)

CORRECTIVE ACTION

1. Replace switch (WP 0186).
2. Verify problem is solved.

MALFUNCTION

DEFECTIVE MANIFOLD HEATER GLOW PLUGS OR LEADS ARE DEFECTIVE

CORRECTIVE ACTION

1. Replace glow plugs or leads (WP 0220) or (WP 0187).
2. Verify problem is solved.

MALFUNCTION

IMPROPER GRADE OF FUEL

CORRECTIVE ACTION

1. Fill with proper grade of fuel.
2. Verify problem is solved.

MALFUNCTION

FUEL INJECTION NOZZLE IS DIRTY OR CLOGGED

CORRECTIVE ACTION

1. Replace fuel injection nozzle(s) (WP 0191).
2. Verify problem is solved.

MALFUNCTION

ENGINE TIMING IS INCORRECT (ONAN)

CORRECTIVE ACTION

1. If engine timing is incorrect, reset timing.
2. If engine timing is correct, perform troubleshooting for low engine compression (WP 0072).
3. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE IS HARD TO START OR HAS LOW POWER

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0011
WP 0181
WP 0179
WP 0194

References (cont.)
WP 0195
WP 0202
WP 0203
WP 0210

Equipment Condition
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

ENGINE IS HARD TO START OR HAS LOW POWER

MALFUNCTION

IMPROPER ENGINE OIL GRADE FOR CURRENT CONDITIONS

CORRECTIVE ACTION

1. Drain and refill engine with proper grade to proper level (WP 0179) or (WP 0181).
2. Verify problem is solved.

MALFUNCTION

IMPROPER GRADE OF FUEL

CORRECTIVE ACTION

1. Drain fuel tank and fill with proper fuel (WP 0011).
2. Verify problem is solved.

MALFUNCTION

FUEL LINES ARE LEAKING OR DAMAGED

CORRECTIVE ACTION

WARNING

- Make sure that grounding connections are made properly and firmly before any fueling operations begin so that grounding connections will not release. This will eliminate the possibility of static electricity creating sparks, which will ignite the fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- It is important that all fuel handling and operating procedures be followed precisely. A detailed study of FM 10-67-1 is essential for all fuel handling operations. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Tighten all loose connections and replace all damaged fuel lines (WP 0202) or (WP 0203).
2. Verify problem is solved.

MALFUNCTION

AIR INTAKE FILTER IS CLOGGED OR DAMAGED

CORRECTIVE ACTION

Check air cleaner restriction indicator for display of red band and examine air filter for clogs or damage (WP 0194) or (WP 0195).

- If restriction indicator shows a red band or the air filter is clogged or damaged, replace filter element (WP 0194) or (WP 0195).
- Remove air cleaner intake cap and tube and clean as necessary (WP 0222).
- Verify problem is solved.

MALFUNCTION

FUEL FILTER IS DIRTY, CLOGGED, OR DAMAGED

CORRECTIVE ACTION

1. Replace fuel filter (WP 0210).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
LOW OIL PRESSURE

INITIAL SETUP:

References
WP 0009
WP 0176
WP 0184
WP 0227

Equipment Condition
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

LOW OIL PRESSURE

MALFUNCTION

OIL LEVEL LOW

CORRECTIVE ACTION

1. Fill to proper level (WP 0009).
2. Verify problem is solved.

MALFUNCTION

EXTERNAL OIL LEAK PRESENT

CORRECTIVE ACTION

1. Repair Lombardini oil leaks or replace Onan engine (WP 0176).
2. Verify problem is solved.

MALFUNCTION

OIL GAGE IS DEFECTIVE

CORRECTIVE ACTION

1. Replace gage (WP 0227).
2. Verify problem is solved.

MALFUNCTION

OIL BYPASS VALVE STUCK IN OPEN POSITION

CORRECTIVE ACTION

1. Replace oil bypass valve and spring.
2. Verify problem is solved.

MALFUNCTION

ENGINE OIL PUMP IS FAULTY OR WORN

CORRECTIVE ACTION

1. Replace engine oil pump (WP 0184).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
HIGH OIL PRESSURE INDICATED ON GAGE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Wheels chocked

References
WP 0009

TROUBLESHOOTING PROCEDURE

SYMPTOM

HIGH OIL PRESSURE INDICATED ON GAGE

MALFUNCTION

ENGINE OIL OVERFILLED

CORRECTIVE ACTION

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Drain to proper level (WP 0009).
2. Verify problem is solved.

MALFUNCTION

IMPROPER ENGINE OIL GRADE

CORRECTIVE ACTION

WARNING

- Make sure that grounding connections are made properly and firmly before any fueling operations begin so that grounding connections will not release. This will eliminate the possibility of static electricity creating sparks, which will ignite the fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- It is important that all fuel handling and operating procedures be followed precisely. A detailed study of FM 10-67-1 is essential for all fuel handling operations. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Drain and refill with proper engine oil (WP 0009).
2. Verify problem is solved.

MALFUNCTION

OIL BYPASS VALVE STUCK IN CLOSED POSITION

CORRECTIVE ACTION

1. Replace valve and spring.
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE MISFIRES

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0009
WP 0193
WP 0194

References (cont.)
WP 0195
WP 0210

Equipment Condition
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

ENGINE MISFIRES

MALFUNCTION

AIR INTAKE FILTER IS CLOGGED OR DAMAGED

CORRECTIVE ACTION

Check air cleaner restriction indicator for display of red band and examine air filter for clogs or damage.

- If restriction indicator shows a red band or the air filter is clogged or damaged, replace filter (WP 0194) or (WP 0195).
- Remove air cleaner intake cap and tube and clean as necessary.
- Verify problem is solved.

MALFUNCTION

FUEL FILTER IS DIRTY, CLOGGED, OR DAMAGED

CORRECTIVE ACTION

1. Replace fuel filter (WP 0210).
2. Verify problem is solved.

MALFUNCTION

IMPROPER GRADE OF FUEL

CORRECTIVE ACTION

WARNING

- Make sure that grounding connections are made properly and firmly before any fueling operations begin so that grounding connections will not release. This will eliminate the possibility of static electricity creating sparks, which will ignite the fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- It is important that all fuel handling and operating procedures be followed precisely. A detailed study of FM 10-67-1 is essential for all fuel handling operations. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Drain fuel tank and refill with proper grade of fuel (WP 0009).
2. Verify problem is solved.

MALFUNCTION

FUEL INJECTION NOZZLES ARE DIRTY, CLOGGED, OR DAMAGED

CORRECTIVE ACTION

1. Replace fuel injection nozzle (WP 0210).
2. Verify problem is solved.

MALFUNCTION

FUEL INJECTION PUMP IS FAULTY

CORRECTIVE ACTION

1. Replace fuel injection pump (WP 0193).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE SPEED IS ERRATIC OR WILL NOT MAINTAIN STEADY RPM

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0193
WP 0202
WP 0203

References (cont.)
WP 0212
WP 0250

Equipment Condition
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

ENGINE SPEED IS ERRATIC OR WILL NOT MAINTAIN STEADY RPM

MALFUNCTION

FUEL SYSTEM IS DEFECTIVE

CORRECTIVE ACTION

WARNING

- Make sure that grounding connections are made properly and firmly before any fueling operations begin so that grounding connections will not release. This will eliminate the possibility of static electricity creating sparks, which will ignite the fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- It is important that all fuel handling and operating procedures be followed precisely. A detailed study of FM 10-67-1 is essential for all fuel handling operations. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

Inspect fuel lines for leaks and fuel pump for proper operation.

- If leak(s) are found, tighten connections or replace damaged fuel lines (WP 0202) or (WP 0203).
- If fuel pump(s) are defective, replace defective fuel pump(s) (WP 0193).
- Verify problem is solved.

MALFUNCTION

THROTTLE LINKAGE IS LOOSE, DAMAGED, OR DISCONNECTED

CORRECTIVE ACTION

1. Replace or adjust linkage (WP 0212).
2. Verify problem is solved.

MALFUNCTION

MANIFOLD HEATER AND LEAD ARE DEFECTIVE

CORRECTIVE ACTION

1. Replace heater and/or lead (WP 0250).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE EXHAUST IS BLACK OR FUEL CONSUMPTION IS EXCESSIVE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Wheels chocked

References
WP 0009
WP 0176
WP 0195

TROUBLESHOOTING PROCEDURE

SYMPTOM

ENGINE EXHAUST IS BLACK OR FUEL CONSUMPTION IS EXCESSIVE

MALFUNCTION

AIR CLEANER IS DIRTY, CLOGGED, OR DAMAGED

CORRECTIVE ACTION

1. Clean or replace air filter (WP 0195).
2. Verify problem is solved.

MALFUNCTION

IMPROPER GRADE OF FUEL OR FUEL IS DIRTY

CORRECTIVE ACTION

WARNING

- Make sure that grounding connections are made properly and firmly before any fueling operations begin so that grounding connections will not release. This will eliminate the possibility of static electricity creating sparks, which will ignite the fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- It is important that all fuel handling and operating procedures be followed precisely. A detailed study of FM 10-67-1 is essential for all fuel handling operations. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

Inspect fuel for type and contamination.

- If incorrect fuel or contamination is found, drain fuel tank and lines and refill tank with the proper grade of fuel (WP 0009).
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
PREHEAT INDICATOR LAMP WILL NOT LIGHT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0095
WP 0097

References (cont.)
WP 0188
WP 0226

Equipment Condition
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

PREHEAT INDICATOR LAMP WILL NOT LIGHT

MALFUNCTION

PREHEAT INDICATOR LAMP IS BURNED OUT

CORRECTIVE ACTION

1. Replace lamp (WP 0095).
2. Verify problem is solved.

MALFUNCTION

BATTERIES OR BATTERY CABLES ARE UNSERVICEABLE

CORRECTIVE ACTION

WARNING

When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Inspect battery voltage and condition of batteries and cables.

CORRECTIVE ACTION - Continued

- If battery voltage is low, charge or replace batteries (WP 0097).
- If batteries or cables are unserviceable, replace batteries and/or cables (WP 0097).
- Verify problem is solved.

MALFUNCTION

PREHEATER SWITCH IS UNSERVICEABLE

CORRECTIVE ACTION

1. Replace switch.
2. Verify problem is solved.

MALFUNCTION

PREHEATER SOLENOID IS UNSERVICEABLE

CORRECTIVE ACTION

Remove engine junction box cover, turn preheater switch to on position and listen for clicking sound.

- If clicking is heard, replace preheater solenoid (WP 0226).
- If no clicking is heard, replace manifold heater and lead (WP 0188).
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
LOW ALTERNATOR OUTPUT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

References
WP 0217

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

LOW ALTERNATOR OUTPUT

MALFUNCTION

ALTERNATOR IS UNSERVICEABLE

CORRECTIVE ACTION

1. Replace alternator (WP 0217).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
NOISY ALTERNATOR

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

References
WP 0217

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

NOISY ALTERNATOR

MALFUNCTION

ALTERNATOR PULLEY IS LOOSE

CORRECTIVE ACTION

1. Tighten pulley (WP 0217).
2. Verify problem is solved.

MALFUNCTION

ALTERNATOR BOLTS LOOSE OR MISSING

CORRECTIVE ACTION

1. If mounting bolts are loose, tighten bolts (WP 0217).
2. If mounting bolts are present and tight, replace alternator (WP 0217).
3. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
EXCESSIVE OIL CONSUMPTION

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0176

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

EXCESSIVE OIL CONSUMPTION

MALFUNCTION

ENGINE UNSERVICEABLE

CORRECTIVE ACTION

- Replace engine (WP 0176).
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
TAPPING OR CLICKING SOUND FROM CYLINDER HEAD (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0176

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

TAPPING OR CLICKING SOUND FROM CYLINDER HEAD (ONAN)

MALFUNCTION

ENGINE UNSERVICEABLE

CORRECTIVE ACTION

Replace engine (WP 0176).

- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
METALLIC KNOCKING, CLICKING, OR POUNDING FROM CRANKCASE OR CYLINDER HEAD

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0176

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

METALLIC KNOCKING, CLICKING, OR POUNDING FROM ENGINE OR CYLINDER HEAD

MALFUNCTION

ENGINE UNSERVICEABLE

CORRECTIVE ACTION

Replace engine (WP 0176).

- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
LOW ENGINE COMPRESSION

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

References
WP 0176

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

LOW ENGINE COMPRESSION

MALFUNCTION

ENGINE UNSERVICEABLE

CORRECTIVE ACTION

Replace engine (WP 0176).

- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
PUMP FAILS TO DELIVER FUEL

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

References
WP 0252

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

PUMP FAILS TO DELIVER FUEL

MALFUNCTION

CENTRIFUGAL PUMP IS NOT PRIMED

CORRECTIVE ACTION

1. Prime pump.
2. Verify problem is solved.

MALFUNCTION

CENTRIFUGAL PUMP IS LEAKING AIR

CORRECTIVE ACTION

1. If pump is leaking air, replace gasket (WP 0252).
2. If pump is not leaking air, tighten all connections (WP 0252).
3. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
EMERGENCY VALVE LEAKS OR WILL NOT FUNCTION

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

References
WP 0077
WP 0281

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

SYMPTOM

EMERGENCY VALVE LEAKS OR WILL NOT FUNCTION

MALFUNCTION

CABLE IS LOOSE AT OPERATOR VALVE A OR AT EMERGENCY VALVE

CORRECTIVE ACTION

Inspect for loose cable (Figure 1, Item 3) at operator valve A (Figure 1, Item 1) and emergency valve (Figure 1, Item 6).

- If cable (Figure 1, Item 3) is loose, tighten cable connecting U-bolt (Figure 1, Item 4) and nuts (Figure 1, Item 5) at emergency valve (Figure 1, Item 6) (WP 0281).
- If cable (Figure 1, Item 3) is loose, tighten cable bolt (Figure 1, Item 2) and nut (Figure 1, Item 7) at operator valve A (Figure 1, Item 1).
- Verify problem is solved.

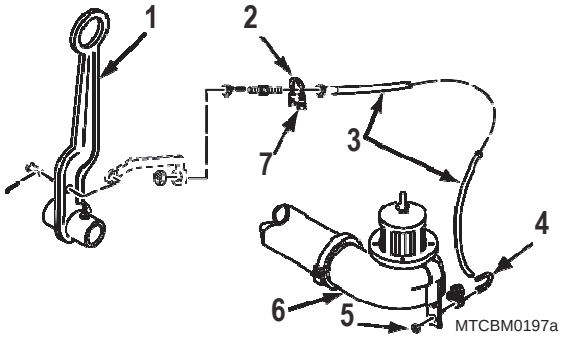


Figure 1. Cable.

MALFUNCTION

LOOSE NUT ON BRACKET ASSEMBLY

CORRECTIVE ACTION

Inspect nut (Figure 2, Item 2) on bracket assembly (Figure 2, Item 1) for security.

- If nut (Figure 2, Item 2) is loose, tighten nut.
- Verify problem is solved.

CORRECTIVE ACTION - Continued

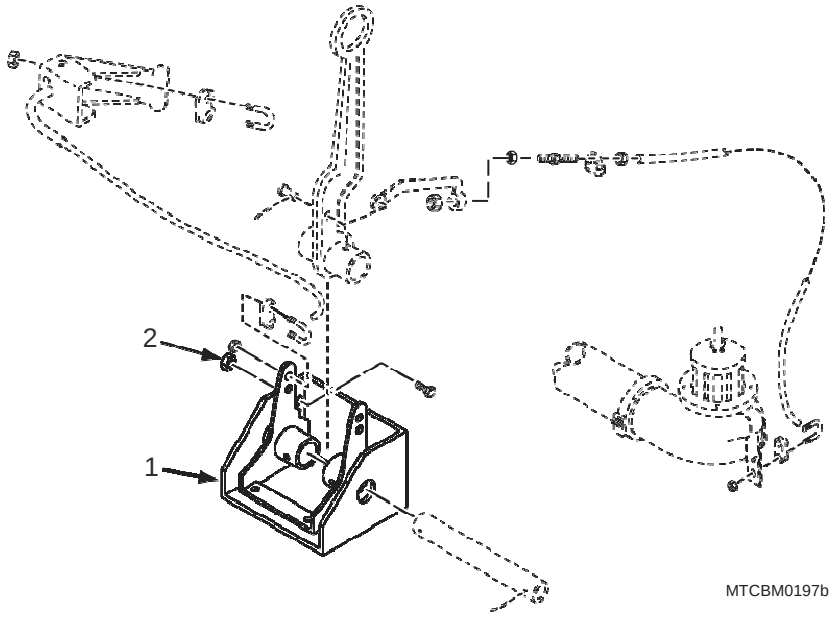


Figure 2. Bracket Assembly.

MALFUNCTION

CABLE IS LOOSE AT OPERATOR VALVE A

CORRECTIVE ACTION

1. Tighten nut on connector bolt (WP 0281).
2. Verify problem is solved.

MALFUNCTION

SPRING IS BROKEN ON TRIP LEVER OR RELEASE LEVER

CORRECTIVE ACTION

1. If spring is broken, replace spring and tighten adjusting bolt and nut on trip link.
2. If spring is not broken, perform troubleshooting for FUEL DOES NOT FLOW DURING ANY FILTERED OPERATION (M969A1) and (M970A1) (WP 0077).
3. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
GATE VALVES OPERATE IMPROPERLY

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

TROUBLESHOOTING PROCEDURE

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

SYMPTOM

GATE VALVES OPERATE IMPROPERLY

MALFUNCTION

HANDWHEEL STEM IS LEAKING

CORRECTIVE ACTION

1. Open valve to raise lock housing and tighten stem nut.
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL DOES NOT FLOW DURING ANY NON-FILTERED FUELING OPERATION

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

References
WP 0096
WP 0281

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

SYMPTOM

FUEL DOES NOT FLOW DURING ANY NON-FILTERED FUELING OPERATION

MALFUNCTION

EMERGENCY VALVE IS DAMAGED OR HAS MISSING PARTS

CORRECTIVE ACTION

1. Replace valve (WP 0281).
2. Verify problem is solved.

MALFUNCTION

EMERGENCY VALVE HAS MISSING OR BROKEN HARDWARE

CORRECTIVE ACTION

1. Replace any missing or broken hardware (WP 0281).
2. Verify problem is solved.

MALFUNCTION

EMERGENCY VALVE CONTROL LEVER IS LOOSE

CORRECTIVE ACTION

1. Tighten control lever mounting bracket (WP 0281).
2. Verify problem is solved.

MALFUNCTION

EMERGENCY VALVE CONTROL CABLE GUIDE IS DAMAGED

CORRECTIVE ACTION

1. Replace cable guide (WP 0096).
2. Verify problem is solved.

MALFUNCTION

EMERGENCY VALVE CONTROL CABLE IS LOOSE, STRETCHED, OR DAMAGED

CORRECTIVE ACTION

1. Replace control cable (WP 0096).
2. Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL DOES NOT FLOW DURING ANY FILTERED FUELING OPERATION (M969A1, M969A2, AND M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

References
WP 0073
WP 0281
WP 0236

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

TROUBLESHOOTING PROCEDURE

SYMPTOM

FUEL DOES NOT FLOW DURING ANY FILTERED FUELING OPERATION (M969A1, M969A2, AND M970A1)

MALFUNCTION

EMERGENCY VALVE IS DAMAGED OR HAS MISSING PARTS

CORRECTIVE ACTION

1. Replace valve (WP 0281).
2. Verify problem is solved.

MALFUNCTION

EMERGENCY VALVE HAS MISSING OR BROKEN MOUNTING HARDWARE

CORRECTIVE ACTION

1. Replace any missing or broken hardware (WP 0281).
2. Verify problem is solved.

MALFUNCTION

EMERGENCY VALVE CONTROL LEVER IS LOOSE

CORRECTIVE ACTION

1. Tighten control lever mounting bracket (WP 0281).
2. Verify problem is solved.

MALFUNCTION

EMERGENCY VALVE CABLE GUIDE IS DAMAGED

CORRECTIVE ACTION

1. Replace cable guide (WP 0281).
2. Verify problem is solved.

MALFUNCTION

EMERGENCY VALVE CONTROL CABLE IS LOOSE, STRETCHED, OR DAMAGED

CORRECTIVE ACTION

1. Replace control cable (WP 0281).
2. Verify problem is solved.

MALFUNCTION

FUEL FILTER/SEPARATOR FUSES ARE CLOGGED

CORRECTIVE ACTION

Check reading of filter/separator gage.

- If gage registers 25 psi (172.37 kPa) or more, replace clogged fuses (WP 0236).
- If gage registers less than 25 psi (172.37 kPa), perform troubleshooting for PUMP FAILS TO DELIVER FUEL (WP 0073).
- Verify problem is solved.

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL DOES NOT FLOW DURING OVERWING AND/OR UNDERWING FUELING OPERATION (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

References
WP 0077
WP 0154
WP 0156

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Wheels chocked

TROUBLESHOOTING PROCEDURE

NOTE

Complete troubleshooting steps for FUEL DOES NOT FLOW DURING ANY FILTERED FUELING OPERATION (M969A1, M969A2, and M970A1) before performing these steps (WP 0077).

SYMPTOM

FUEL DOES NOT FLOW DURING OVERWING AND/OR UNDERWING FUELING OPERATION (M970A1)

MALFUNCTION

DEADMAN CONTROL HOSES ARE KINKED

CORRECTIVE ACTION

1. Straighten kinked hoses.
2. Verify problem is solved.

MALFUNCTION

DEADMAN CONTROL CONNECTIONS ARE LEAKING

CORRECTIVE ACTION

WARNING

- Make sure that grounding connections are made properly and firmly before any fueling operations begin so that grounding connections will not release. This will eliminate the possibility of static electricity creating sparks, which will ignite the fuel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- It is important that all fuel handling and operating procedures be followed precisely. A detailed study of FM 10-67-1 is essential for all fuel handling operations. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

Check connections for leaks.

- Replace deadman control, or replace or tighten hoses (WP 0156).
- Verify problem is solved.

MALFUNCTION

DEADMAN CONTROL IS NOT DEACTIVATED

CORRECTIVE ACTION

Depress and hold deadman release plunger for 5 to 10 seconds to deactivate deadman control.

- Verify problem is solved.

MALFUNCTION

DEADMAN VALVE IS INOPERABLE

CORRECTIVE ACTION

1. Replace deadman valve (WP 0154).
2. Verify problem is solved.

END OF WORK PACKAGE

CHAPTER 4

PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

OPERATOR MAINTENANCE
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION

GENERAL

1. To ensure that the semitrailers are ready for operation at all times, they must be inspected on a regular basis so that defects may be found before they result in serious damage, equipment failure, or injury to personnel. This section contains systematic instructions on inspections, adjustments, and corrections to be performed by the Operator and personnel.
2. While performing Preventive Maintenance Checks and Services (PMCS), read and follow all safety instructions found in the Warning Summary at the beginning of this manual. Keep in mind all WARNINGs and CAUTIONs.

SERVICE INTERVALS

Perform the PMCS procedures listed in (WP 0080) at the following intervals:

- Perform Before PMCS just before operating the semitrailer.
- Perform During PMCS while operating the semitrailer.
- Perform Weekly PMCS once each week.
- Perform Monthly PMCS once each month.
- Perform Semiannual PMCS procedures once every six months.
- Perform Annual PMCS procedures once each year.

REPORTING REPAIRS

All defects that the operator cannot fix must be reported on a DA Form 2404 or DA Form 5988E, Equipment Inspection and Maintenance Worksheet, immediately after completing PMCS. If a serious problem is found, IMMEDIATELY report it to your Supervisor.

GENERAL PMCS PROCEDURES

1. Keep equipment clean. Dirt, oil, and debris may cover up a serious problem. Clean as you work and as needed. Use cleaning compound (WP 0293) on all metal surfaces. Use soap (WP 0293) and water on rubber, plastic, and painted surfaces.
2. While performing specific PMCS procedures, inspect the following components:
    a. **Bolts, Nuts, and Screws.** Make sure they are not loose, missing, bent, or broken. Tighten any that are loose. Report loose or missing bolts, nuts, and screws to Field Maintenance.
    b. **Welds.** Inspect for gaps where parts are welded together. Check for loose or chipped paint, rust, and cracks. Report bad welds to Field Maintenance.
    c. **Wiring Harness, Wires, and Connectors.** Inspect for cracked or broken wiring harness insulation, bare wires, and loose or broken connectors. Repair or replace as necessary. Report loose connections and faulty wiring to Field Maintenance.
    d. **Hydraulic Brake Lines and Fittings.** Inspect for wear, damage, and leaks. Make sure fittings are tight. Report any damage, leaks, or loose fittings to Field Maintenance. If a leak originates from a loose fitting, tighten it. If a component is broken or worn, correct the problem if authorized by the Maintenance Allocation Chart (MAC) (WP 0291). If not authorized, report it to your Supervisor.
3. Check to see that components are adequately lubricated in accordance with (WP 0286).

GENERAL PMCS PROCEDURES - Continued

4. Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with the semitrailers be reported so that the problems can be corrected and improvements can be made to prevent the problems in future semitrailers.
5. While corrosion is typically associated with the rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using an SF Form 368. The use of key words, such as "corrosion", "rust", "deterioration", or "cracking" will ensure that the information is identified as a CPC problem see TB 43-0213 . The form should be submitted to the address specified in DA Pam 750-8; for corrective action, notify Field Maintenance.

SPECIFIC PMCS PROCEDURES

1. Operator PMCS procedures are provided in (WP 0080). Always perform PMCS procedures in the order listed. Once the procedures become routine, problems can be easily recognized.
2. Before performing PMCS, read all the checks required for the applicable interval and prepare all the tools needed for the task. Have several soft cloth clean dry rags (WP 0293) ready for use. Perform ALL inspections at the applicable intervals.
3. If any problems are discovered through PMCS, perform the appropriate troubleshooting task (WP 0019). If any component or system is not serviceable, or if a given service does not correct the problem, notify your Supervisor.
4. Explanations of the column headings in (WP 0080) are as follows:
    - **Item No.** The item number column of your PMCS table is to be used for reference. When completing DA Form 2404 or DA Form 5988E, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the interval listed.
    - **Interval.** This column of your PMCS table tells you when to do a certain check or service.
    - **Item To Check/Service.** This column names the item to be checked or serviced.
    - **Procedure.** This column tells you how to do the required checks and services. Follow these instructions carefully. If tools are not available or if the procedure says to, have Field Maintenance do the work.

NOTE

The term mission capable refers to equipment being on hand and able to perform its combat mission. Refer to AR 700-138, Army Logistics Readiness and Sustainability.

- **Not Fully Mission Capable If:** Information in this column tells you what faults will keep the equipment from being capable of performing its mission. If PMCS reveals faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failures.

LEAKAGE DEFINITIONS

It is necessary for you to know how fluid leakage affects the status of the semitrailer. Following are types/classes of leakage you need to know to be able to determine the status of the semitrailer. Learn these leakage definitions and remember - when in doubt, notify your Supervisor. Equipment operation is allowed with minor leakage (Class I or II). Consideration must be given to fluid capacity in the item/system being checked/inspected. When in doubt, notify your Supervisor.

When operating with Class I or II leaks, continue to check fluid levels as required in the PMCS.

LEAKAGE DEFINITIONS - Continued

Class:

1. **Class I:** Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
2. **Class II:** Leakage of fluid great enough to form drops, but not enough to cause drops to drip from item being checked/inspected.
3. **Class III:** Leakage of fluid great enough to form drops that fall from item being checked/inspected.

Equipment operation is allowed with minor (Class I or II) leakage. Fluid levels in an item/system affected with such leakage must be checked more frequently than required in PMCS. When in doubt, notify your Supervisor.

Report Class III leaks IMMEDIATELY to your Supervisor or Field Maintenance.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) PROCEDURES

INITIAL SETUP:

Not Applicable

Table 1. Preventive Maintenance Checks and Services.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
1	Before	Exterior of Semitrailer	**NOTE** Perform Weekly as well as Before if: 1. You are the assigned operator but have not used the semitrailer since the last week. 2. You are operating the semitrailer for the first time.	
			Walk around semitrailer. Check for evidence of fuel leakage on or under semitrailer.	Any fuel leakage is evident.
			Check fire extinguishers. Make sure red button is down. Check security of mounting bracket.	Fire extinguisher missing. Red button is up.

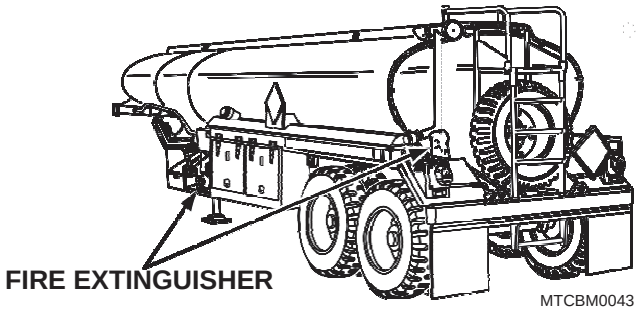


Figure 1. Component Locations.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
2	Before	Tank	Check for operation of hazardous materials placards.	Missing or inoperative.
			Inspect tank shell for dents, leaks, and broken welds.	Tank shell has fuel leaks.
			Check for leaks around fusible vent caps. Tighten caps if loose.	Any fuel leaks are present.
			Check for leaks around manhole cover. If leaks are evident, check for damaged cover gasket, loose mounting ring and that cover can be opened, closed, and securely latched.	Manhole cover gasket is damaged, manhole cover cannot be securely latched, or any fuel leaks are present.
			Inspect front and rear catwalk drains for clogs or restrictions. Remove any debris or foreign matter.	
			Inspect vapor recovery hood assembly for any loose, damaged, or missing hardware.	
			Check tank for rust at intersections where brackets are welded to tank. Check condition of paint. If any damage is found, notify your supervisor.	
3	Before	Towing Connections	Inspect bolt-on kingpin or upper coupler (kingpin) plate for damage or loose mounting bolts.	Bolt-on kingpin or upper coupler (kingpin) plate damaged or mounting bolts loose.
			Visually inspect for obvious cracked or broken welds along upper coupler (kingpin) plate.	Any welds are cracked or broken.

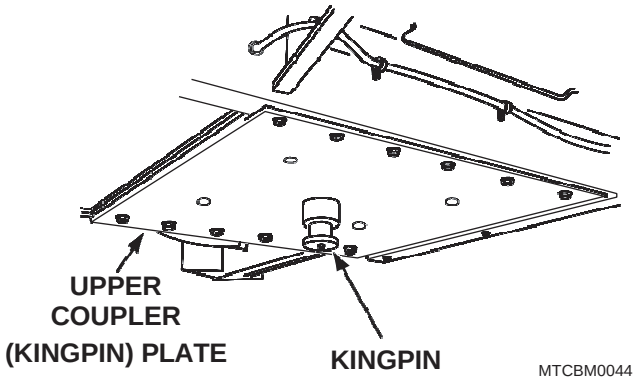


Figure 2. Kingpin.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
4	Before	Engine Assembly	Using a suitable container, drain water from both fuel filters. Loosen, but do not remove drain plugs at bottom of filter. Allow fuel to drain until clear of water. Tighten drain plugs. Lombardini engines only use one fuel filter. Perform before operation checks of engine operating instructions.	Engine does not operate and is required for mission.
5	Before	Centrifugal Pump	Inspect pump for signs of leaks.	Any fuel leaks are present.
6	Before	Batteries	Check batteries for secure mounting.	Battery is damaged and is required for mission.
7	Before	Filter Separator (M969A1, M969A2, and M970A1)	Check for debris in relief valve at top of filter separator. Remove debris.	

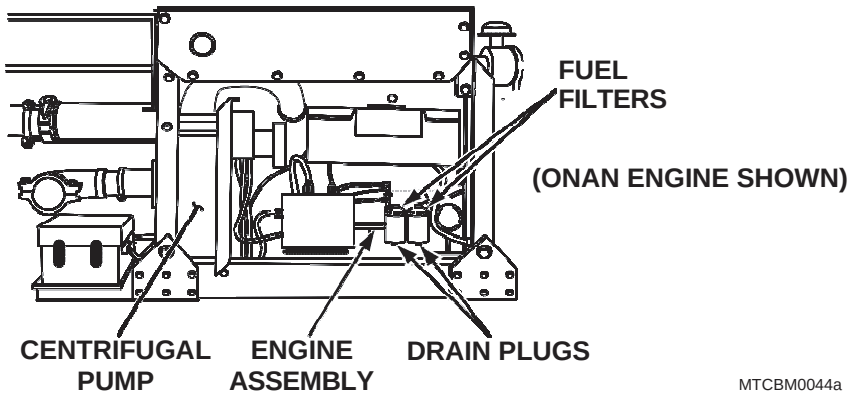


Figure 3. Centrifugal Pump (Lombardini engine has only one fuel filter).

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
8	Before	Hose Troughs	Visually inspect hose lock bars for obvious damaged or missing parts. Check all mounting hardware for loose or missing components.	

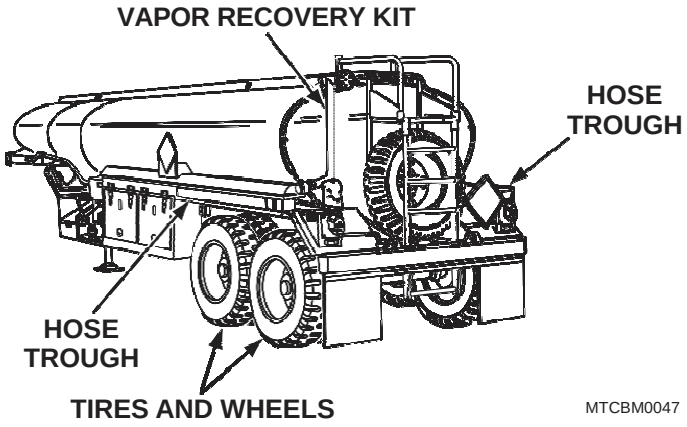


Figure 4. Tires and Wheels.

9	Before	Vapor Recovery Kit (M970A1 or any of the models if equipped)	Check discharge outlet for debris or any other foreign matter. Check all mounting hardware for loose or missing components.	If mission requires any components.
10	Before	Tires and Wheels	Inspect tires for unusual wear or damage.	Any tires missing or have damage that could result in tire failure.
11	Before	Spare Tire Winch	Visually inspect spare tire winch assembly for loose, damaged, or missing components. Visually inspect for frayed or worn cable.	 Cable is frayed or worn.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
12	Before	Hose Reels (M969AI, M969A2, and M970A1)	Check operation of rewind handle.	Rewind handle is inoperable or missing.

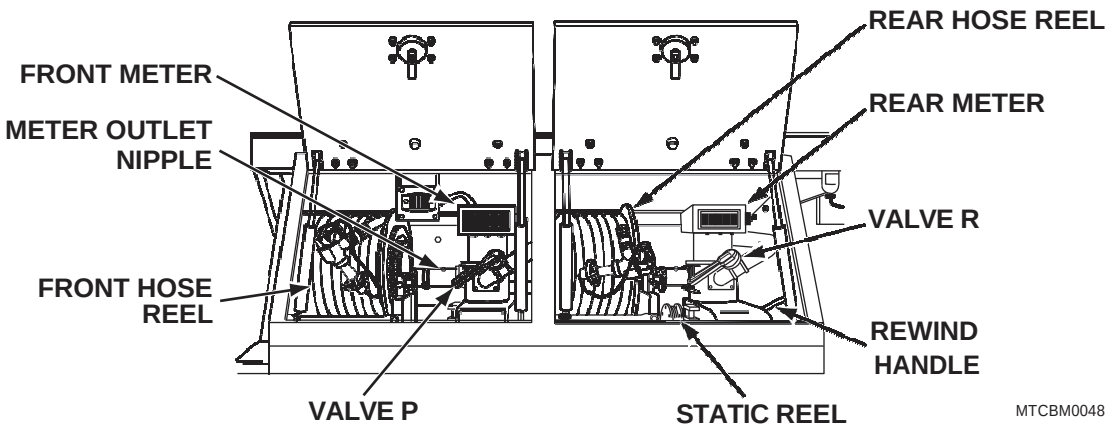


Figure 5. Hose Reel Cabinet (M969A1).

13	Before	Meter Indicator (M969A1, and M969A2)	Check outlet nipple on either meter with aqua-glo probe for water contamination in fuel.	Fuel sample has water contamination (aircraft refueling operation only).
14	Before	Grounding Devices	Check static reel operation. Inspect for missing grounding clips and loose or missing mounting hardware.	Missing from vehicle or damaged.
			Check portable grounding rod to ensure that it is not damaged or missing.	Missing from vehicle or damaged.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
15	Before	Deadman Control Meter Gage (M970A1)	Check deadman gage for damage.	

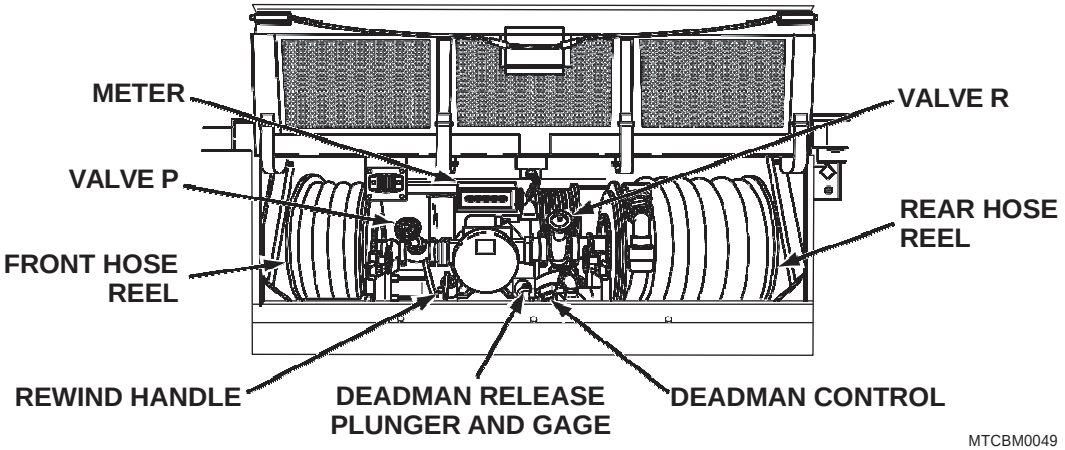


Figure 6. Hose Reel Cabinet (M970A1).

16	During	Piping System	Check all valves and couplings for leaks. Check valves P and R for proper operation.	Any fuel leaks are present. Valve is hard to open or close.
17	During	Towing Connections	Connect Prime Mover air lines to couplings on semitrailer. With Prime Mover engine running, check air lines and couplings for air leaks.	Air leaks are present.

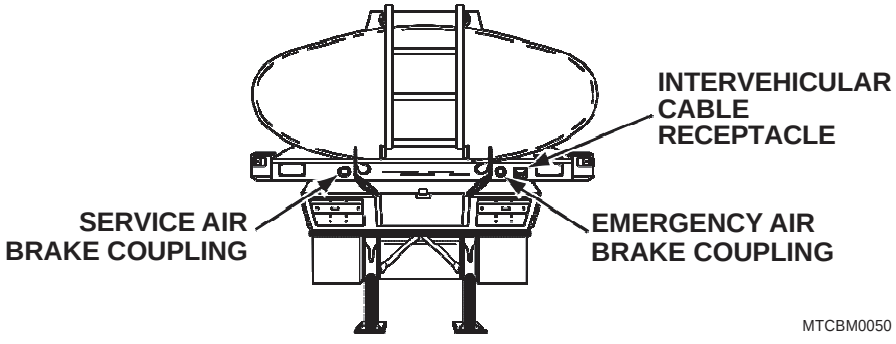


Figure 7. Air Brake Couplings.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
18	During	External Lights	Connect Prime Mover electrical line to receptacle on semitrailer. Check all lights for damage. Check that all lights are operating, check tightness of connection at receptacle. If tight, and lights still do not operate, notify Field Maintenance. Check electrical line for damage.	Turn signal and stop lights not operating. Prime mover inter-vehicular cable is damaged (cuts, cracks, broken wires, etc.)

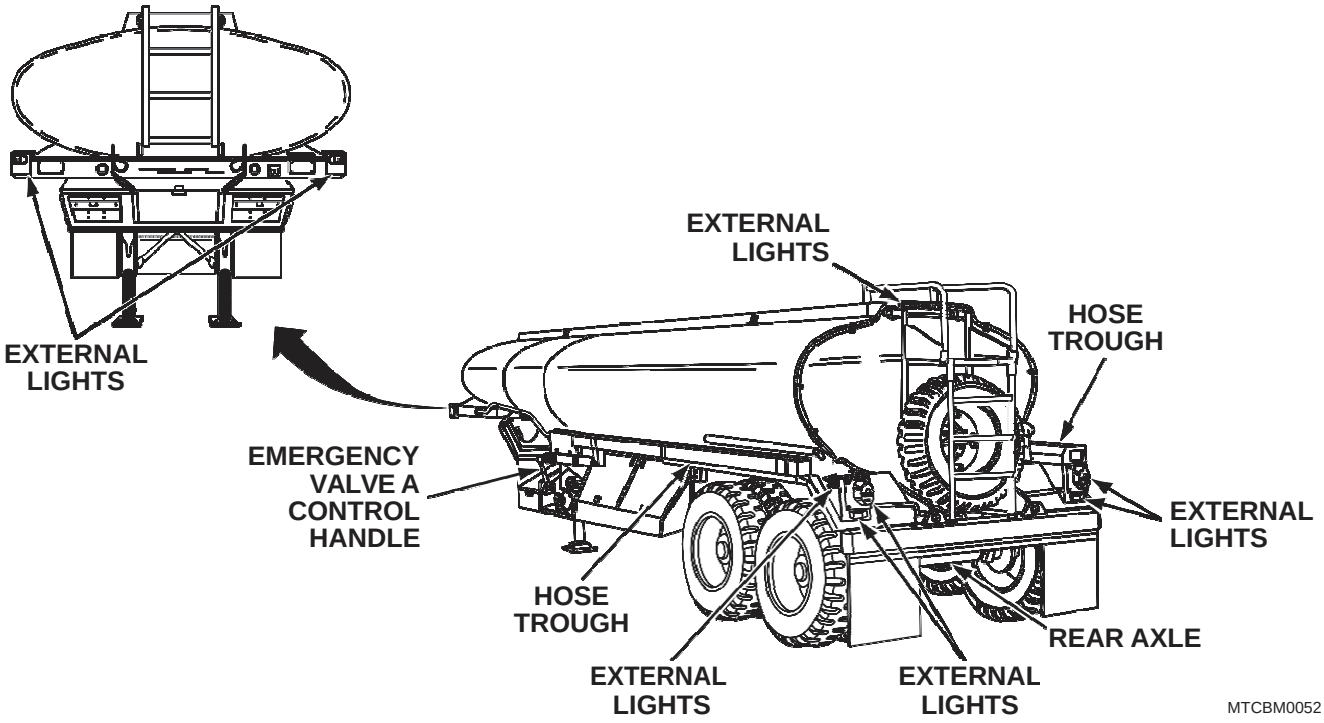


Figure 8. External Lights and Emergency Valve A Control Handle.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
19	During	Landing Gear	After coupling Prime Mover to semitrailer, engage landing gear handle and raise and lower landing gear legs. Inspect landing leg ground boards for serviceability.	Landing gear legs cannot be raised or lowered. Wood is required for mission but is dry rotted.

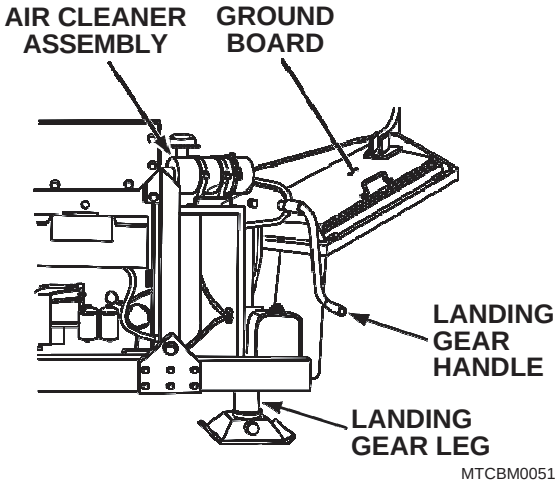


Figure 9. Air Cleaner Assembly and Landing Gear.

20	During	Brake System	With Prime Mover coupled to semitrailer, apply Prime Mover brakes and inspect service and emergency air brake couplings, all air lines and fittings for leaks. If leaks are found, notify Field Maintenance. Apply semitrailer brakes and observe operation.	Any leaks are present. Brakes do not stop semitrailer or semitrailer pulls to one side.
21	During	Emergency Valve and Vent	With all valves closed, move emergency valve A control handle to the OPEN position. On the front curbside of the semitrailer, pull the emergency valve shut-off control. Observe that emergency valve A control handle has moved to the CLOSED position.	Control lever A does not move to the CLOSED position.

Table 1. Preventive Maintenance Checks and Services - Continued.

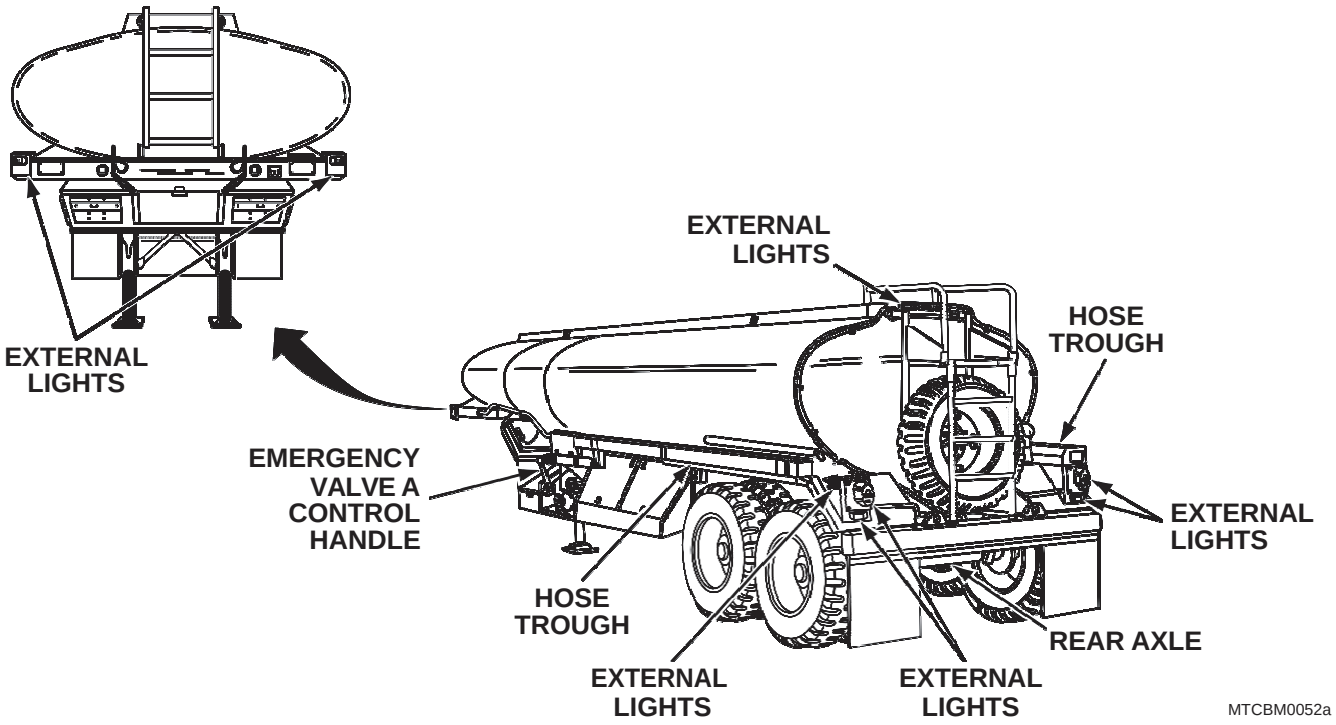
ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
				
			Figure 10. External Lights and Emergency Valve A Control Handle.	
			With all valves closed, operate emergency valve A control handle and ensure that the cable is actuating the emergency valve shut-off control and opens the vent on of semitrailer.	Emergency valve A control handle will not actuate emergency valve shut-off control, or vent fails to open.
			Check brake interlock valve for leaks or damage.	Inoperative or leaking.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
22	During	Engine Assembly	Check that red area is not visible in air cleaner restriction indicator. Remove and clean engine air cleaner element, if required. Replace after six cleanings or annually.	Restriction indicator has red area visible.
			Check for fuel and oil leaks.	Any fuel leaks or Class III oil leaks are present.

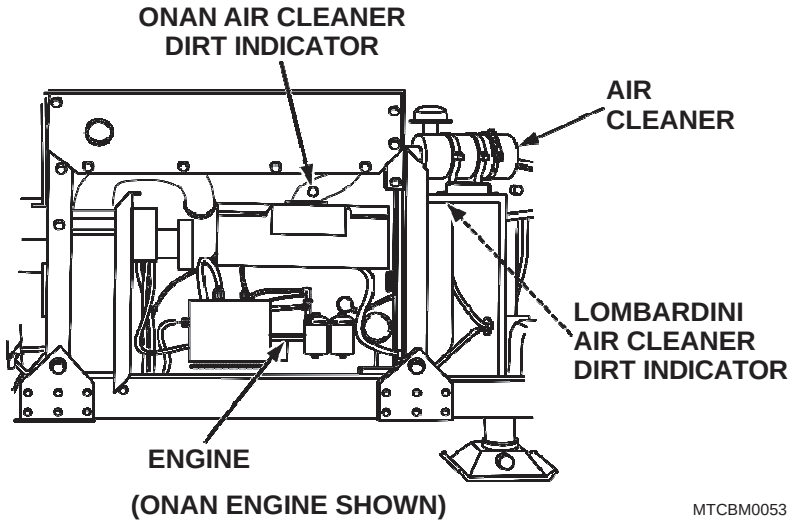


Figure 11. Restriction Indicator.

23	During	Filter/Separator (M969A1, M969A2, and M970A1)	Place spill container under automatic drain valve. Check automatic drain valve on bottom of filter/ separator for fuel seepage. No other liquid except water should be detected at the automatic drain valve.	Any fuel leaks are present.
24	During	Rear Axles	During movement of semitrailer, be aware of wander or side pull. Listen for excessive noise. These are indications of improper axle alignment.	Semitrailer wanders, has side pull, or axles make excessive noise.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
25	During	Hose Reels (M969A1, M969A2, and M970A1)	When unwinding hoses, observe for binding in the hose reel.	Hose reel will not unwind hose.
			Inspect hoses for cuts and cracks.	Cuts or cracks in hoses which allow any detectable leakage.

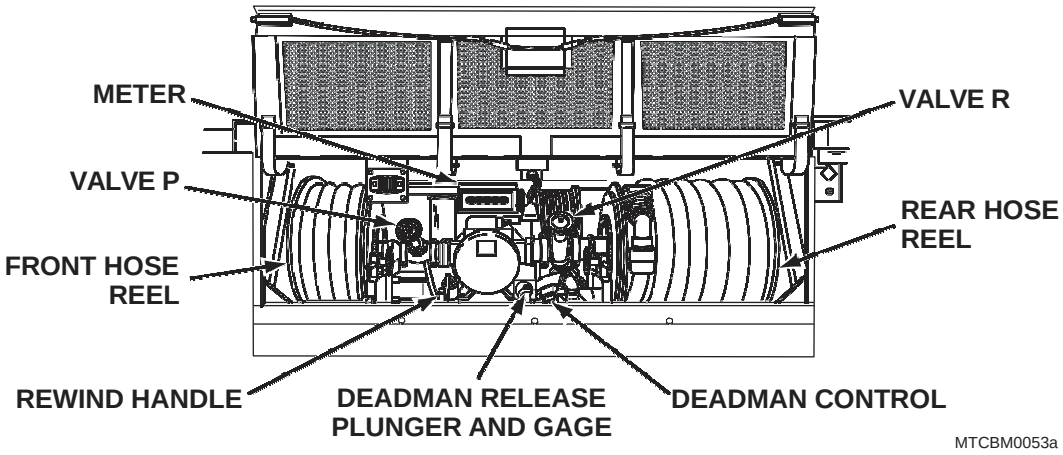


Figure 12. Hose Reel Assembly (During).

26	During	Meter Indicator (M969A1, M969A2, and M970A1)	Check meters for registration of fuel being dispensed.	

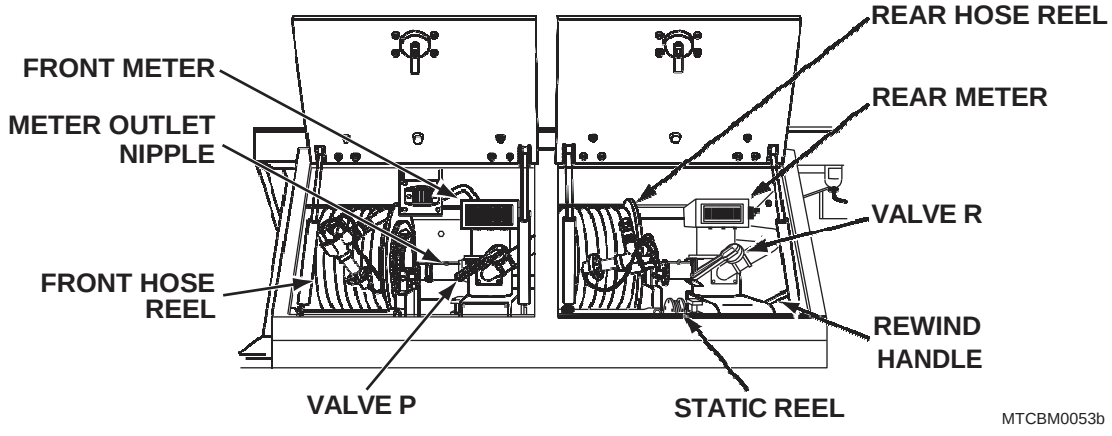


Figure 13. Meter Indicator.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
27	During	Precheck Control	Check operation of shut-off float. Inspect operation of shut-off float, (M969A2 model trailers only).	Precheck system does not operate. Control lever does not move freely from closed to open position. Precheck system does not operate. Emergency valve A control panel does not move freely from closed to open position.
28	During	Load/Unload Selector System (M967A1, M969A1, and M969A2)	Check operation of selector control. Check operation of selector control (M969A2 model trailers only).	Selector system does not operate. Control lever does not move freely from closed to open position.
29	During	Deadman Control (M970A1)	Unwind deadman control hoses and check for operation of hose reel. Inspect for damage to the control and hoses. Check for leaks when operating the control.	Hose will not unwind or binding is noticed in the hose reel when unwinding or rewinding hose. Leaks are evident at connections.
30	During	Deadman Gage (M970A1)	Check at what pressure the 3 in. control valve opens. Pressure gage should read 80 psi (551.6 kPa).	

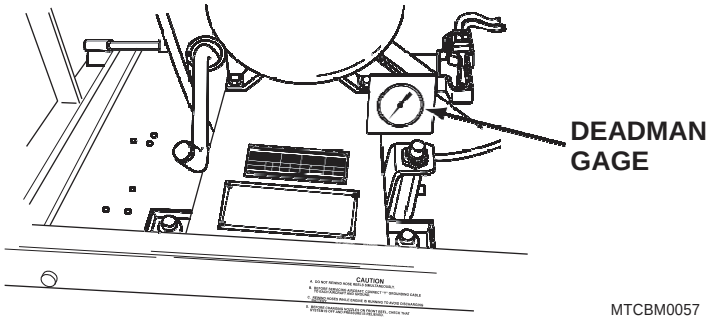


Figure 14. Deadman Gage.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
31	During	Control Panel	Check switches for proper operation.	Switch does not complete its function.
			Check that preheat indicator light is lit when engine is preheating.	Light is not lit.
			Check gages for proper operation as follows:	

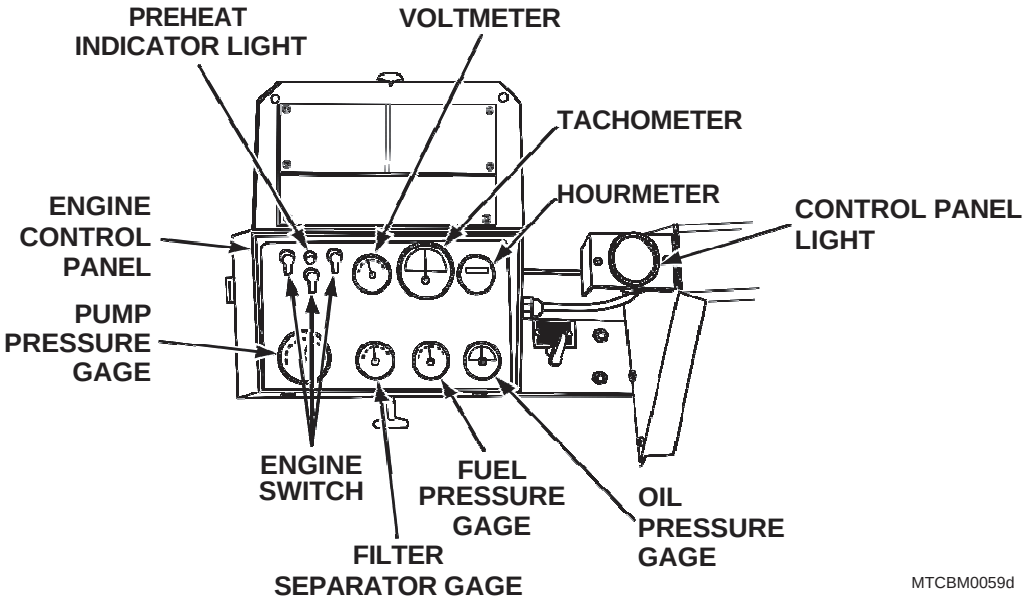


Figure 15. Control Panel.

			Check tachometer operation.	Tachometer is inoperative or operates erratically.
			Battery voltage gage should read 12-14 V dc with engine running.	
			Oil pressure gage should read 30-40 psi (206.9-275.8 kPa) with engine warm and running.	Oil pressure gage is inoperative or operates erratically.
			Fuel pressure gage should read 12-14 psi (82.7-96.5 kPa).	
			Pump pressure gage should read 30 psi (206.9 kPa) for 4 in. low-head pump (M967A1, M969A1, and M969A2) or 65 psi (448.17 kPa) for 3 in. high pressure pump (M970A1).	Pump pressure gage is not functioning properly during retail (pumping) operations.
			Check filter/separator gage.	Gage indicates 20 psi (137.9 kPa) or higher.
			Check secure lighting for operation.	

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
32	After	Piping System	Inspect all pipes for dents and cracks. Drain water from piping system drains.	Pipes are damaged to the extent that fuel flow will be restricted. Pipes are cracked, allowing fuel leakage.

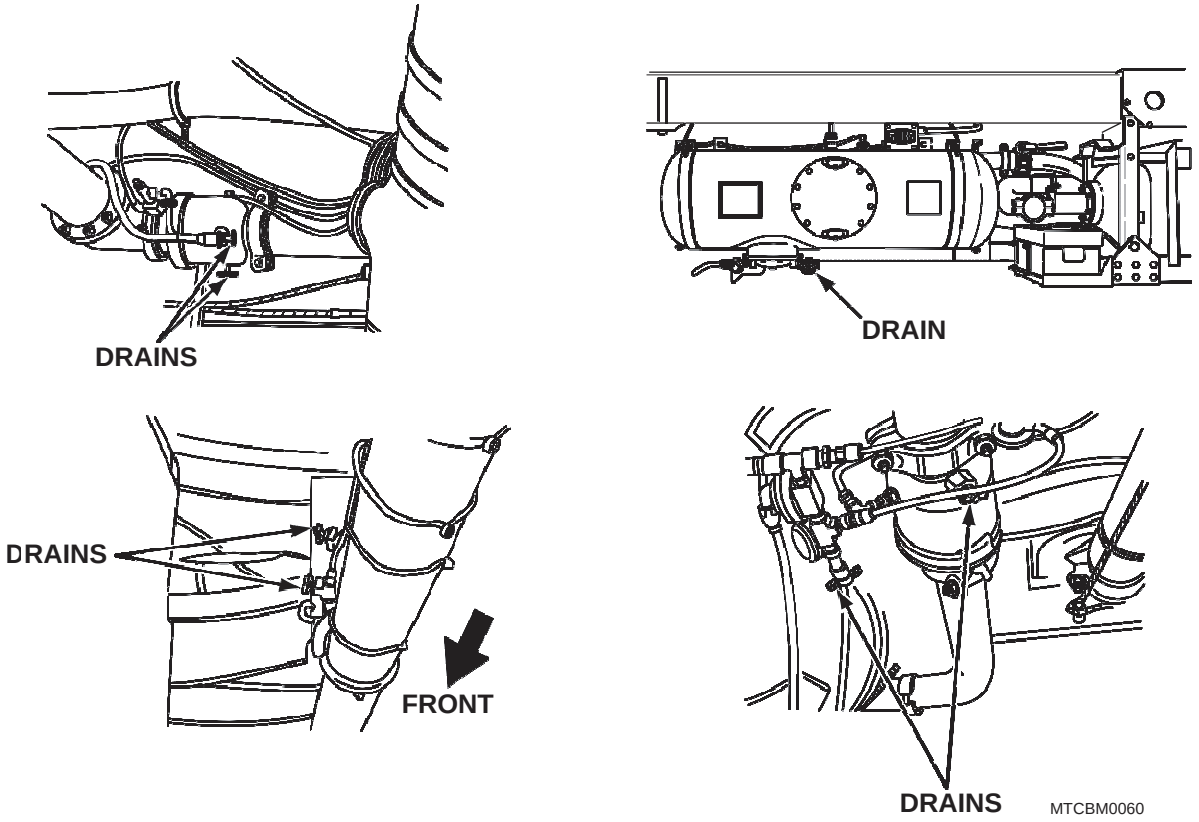


Figure 16. Drain Locations.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
33	After	Brake System	Drain water from both air reservoirs by opening the air reservoir drain cocks.	

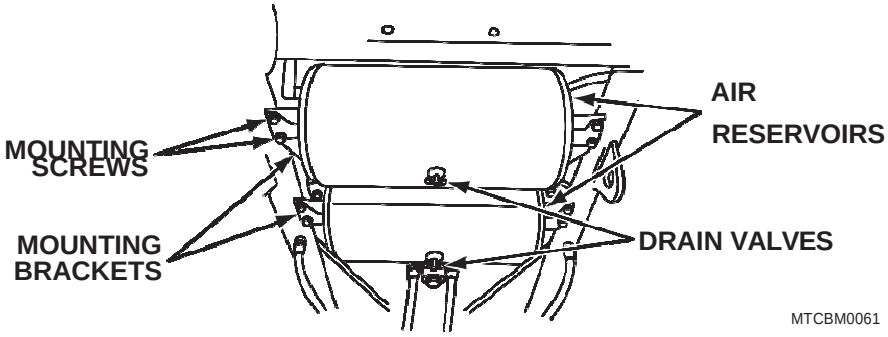


Figure 17. Air Reservoir.

			Check mounting screws and brackets for loose, missing hardware.	Mounting screw and bracket are loose, missing, or damaged.
34	After	Engine Assembly	Inspect for debris in grille of air cooling intake area. Inspect alternator belt for tightness and cracks. Inspect hoses and connections for tightness and leaks. Inspect electrical harnesses for tightness and cracks. Check engine oil level. Add oil if needed. Check fuel tank for fuel. Add if needed. 1/4 of tank is required.	Engine does not operate and is required for mission.
35	After	Hose Troughs	Inspect troughs for debris. Remove any debris found and check that water drain holes are open.	

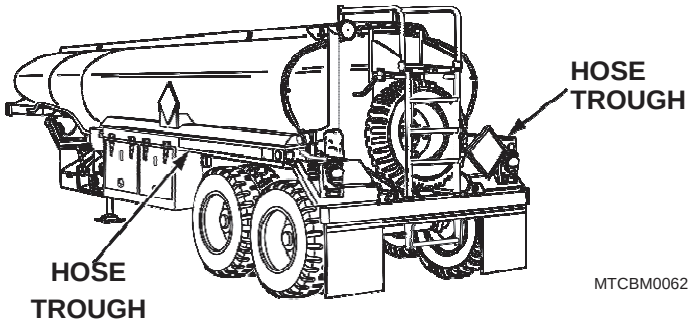


Figure 18. Hose Trough.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
36	After	Filter Separator (M969A1, M969A2, and M970A1)	Using suitable container, open manual drain valve and drain off water until fuel is present. Shut off valve.	Filter/separator is clogged or damaged.
37	Weekly	Landing Gear	Inspect for loose shoes, bent. Of damaged landing gear legs, and loose or missing mounting bolts.	Mounting bolts loose or missing.

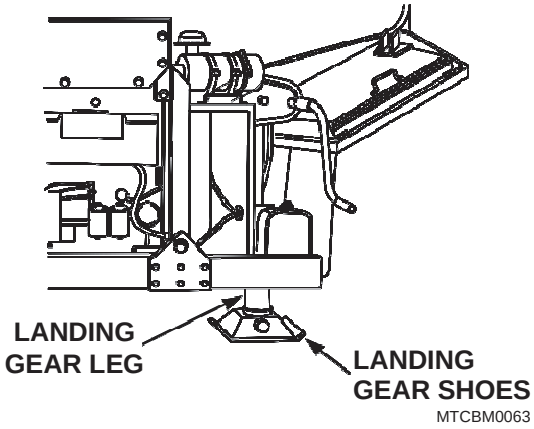


Figure 19. Landing Gear.

38	Weekly	Engine Assembly	Visually inspect for loose engine cowling or shrouds.	Any cowling or shroud is missing.
39	Weekly	Centrifugal Pump	Remove pipe plug and check oil level. Add oil if below bottom of pipe plug hole for oil specifications.	
40	Weekly	Batteries	Remove battery cover. Check electrolyte level in each cell. If low, notify Field Maintenance. Check for corrosion and damage.	Battery is damaged.

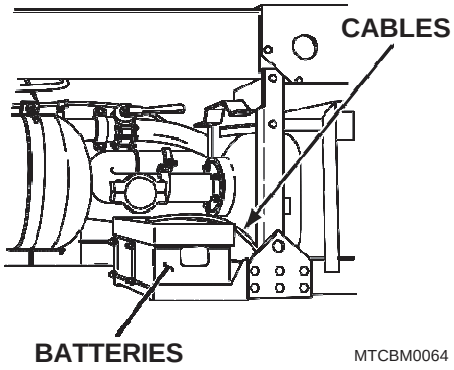


Figure 20. Batteries.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
41	Weekly	Battery Cables and Terminals	Check for corrosion at terminals. Check cable tightness on terminals. Check for cable damage. If terminals are loose or damaged, notify Field Maintenance.	
42	Weekly	Tires and Wheels	Check for proper air pressure under these conditions: Bias-Ply tires hard road - 60 psi (413.7 kPa). Cross-country 40 psi (275.8 kPa). Radial tires hard road - 90 psi (620.5 kPa). Cross-country - 45 psi (310.3 kPa).	
43	Monthly	Tires and Wheels	Inspect wheels for cracks or other damage. Check tightness of wheel nuts or wheel studs. Inspect spare tire for secure mounting.	Wheel damaged or three or more wheel nuts or wheel studs missing.
44	Monthly	Suspension	Visually inspect bogie for obvious damage. Inspect springs for broken leaves. Visually inspect suspension hardware for obvious damage.	 Loose or missing suspension hardware.

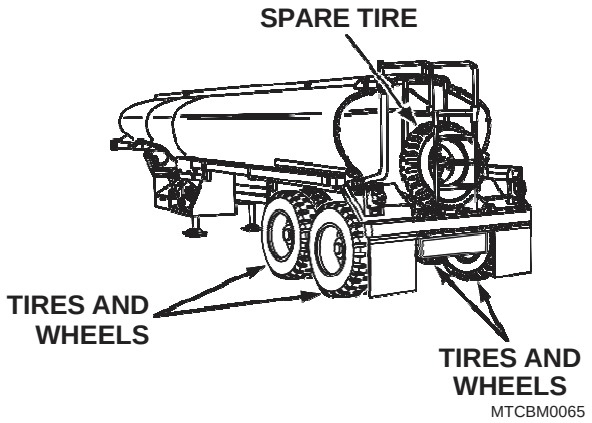


Figure 21. Tires and Wheels.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
45	Monthly	Nozzles	Clean nozzle screens.	
			Check that lockup handle moves freely and is not damaged.	Lockup handle is missing, damaged, or inoperative.
			Check that plastic indicator on top of fire extinguisher is intact.	Plastic indicator is missing, damaged, or inoperative.
			Check to see that safety wire lead or plastic seal is not broken or missing.	Safety wire lead or plastic seal is missing, damaged, or inoperative.
			Check to see that tube is not kinked and nozzle is free of obstructions.	Tube or nozzle is missing, damaged, or inoperative.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) PROCEDURES

INITIAL SETUP:

References
- DA Form 2407
- SOUM 13-008
- TM 9-6140-200-14
- WP 0098
- WP 0117
- WP 0119
- WP 0121
- WP 0124
- WP 0125
- WP 0135

References (cont.)
- WP 0136
- WP 0140
- WP 0142
- WP 0179
- WP 0181
- WP 0210
- WP 0218
- WP 0254
- WP 0286

Table 1. Preventive Maintenance Checks and Services.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
			CAUTION Some semitrailers may have axles with different configurations. Bearing maintenance intervals are different for hub piloted axles and stud piloted axles. Verify which axles the semitrailer has and perform the proper service. Failure to comply may result in damage to, or destruction of, equipment or mission. **NOTE** Perform Operator/Crew PMCS prior to, or in conjunction with, Field PMCS if there is a delay between daily operation of semitrailer and Field PMCS or if the regular operator is not assisting/participating.	
1	Semi-Annual	Tank	Check tank for rust at intersections where brackets are welded to tank. Check condition of paint. Notify Supervisor if any damage is found.	
2	Semi-Annual	Electrical System	Check chassis electrical harness connections for security and condition. Check harnesses for worn or frayed insulation. Repair/replace damaged harness or connections. Tighten loose connections.	

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
			Inspect intervehicular cable receptacle for damage or corrosion. Repair or replace damaged cable receptacle.	
3	Semi-Annual	Brakes	Check service air brake coupling and emergency air brake coupling for leaks. Tighten if loose. Check coupling packing rings for damage. Replace if damaged (WP 0124).	Air brake system is leaking.
4	Semi-Annual	Piping	Remove and inspect piping strainer. Clean piping strainer if dirty (WP 0254). Replace strainer if heavily clogged or damaged (WP 0254).	Piping strainer is dirty, clogged, or damaged.
5	Semi-Annual	Landing Gear	Check condition and operation of landing gear. Inspect for damage or wear. Replace damaged parts (WP 0140).	If landing gear is damaged.

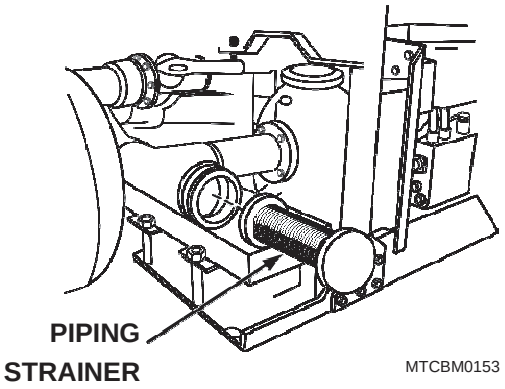


Figure 1. Piping Strainer.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:

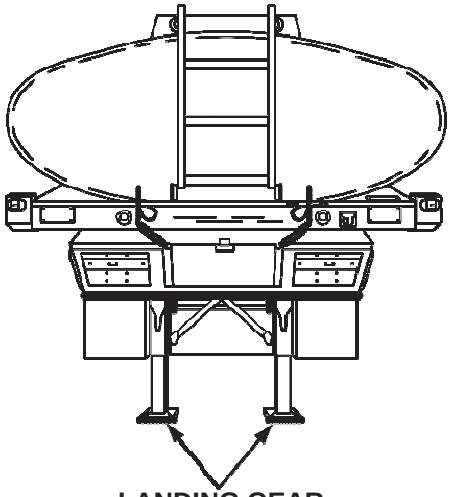


Figure 2. Landing Gear.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
6	Semi-Annual	Batteries and Cables	Check for damaged battery cables and terminals. Replace cables or battery if damaged (WP 0098). Check electrolyte specific gravity. Charge batteries if necessary (Refer to TM 9-6140-200-13).	If battery cables, terminals, or battery are damaged.

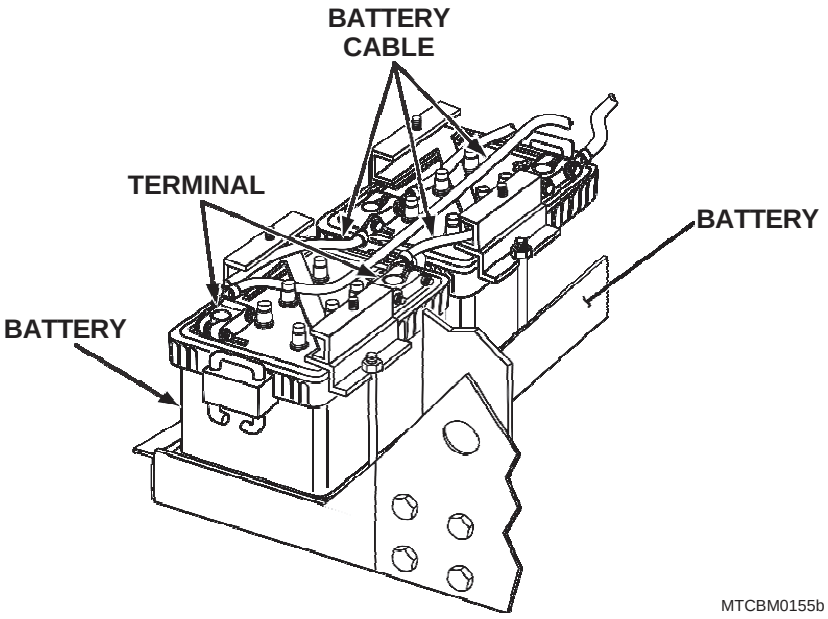


Figure 3. Batteries.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
7	Semi-Annual	Bogie Assembly	Position semitrailer on hard level surface with front resting on landing gear. Jack and block rear of frame. Remove wheels.	
			Inspect general condition of trunnion tube, axles, and leaf springs. Look for cracks or damage. If cracked or damaged, replace (WP 0117).	If trunnion tube, axles, and leaf springs are cracked and/or damaged.
			Check tightness of U-bolts and clips on leaf springs. Tighten loose U-bolts and clips. Replace any damaged or worn parts (WP 0142).	If U-bolts and clips are worn and/or damaged.
			Check tightness of U-bolts and screws on leaf spring cap and seat. Tighten loose U-bolts and screws. Replace any damaged or worn parts (WP 0142).	If U-bolts and screws are worn and/or damaged.
			Check tightness of bolts fastening bogie assembly to trailer frame. Tighten loose bolts. Replace any damaged or worn parts (WP 0117).	If bolts are worn and/or damaged.

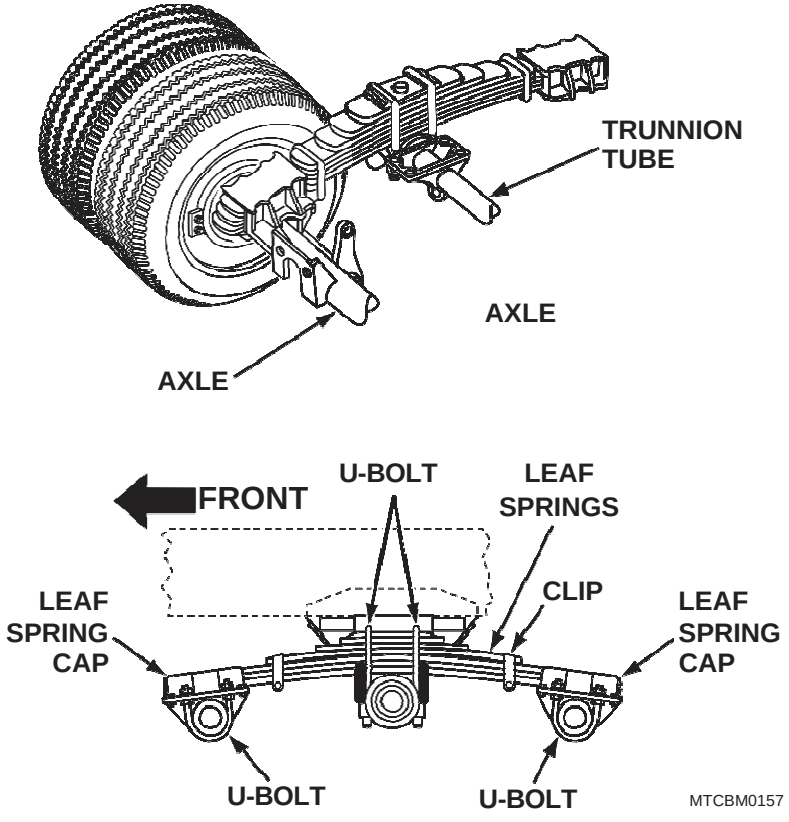


Figure 4. Bogie Assembly.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
8	Semi-Annual	Brakes (Figure 5)	Check brake shoe lining thickness. Replace if lining is within 0.030 in. (0.072 cm) of rivet heads (WP 0121).	

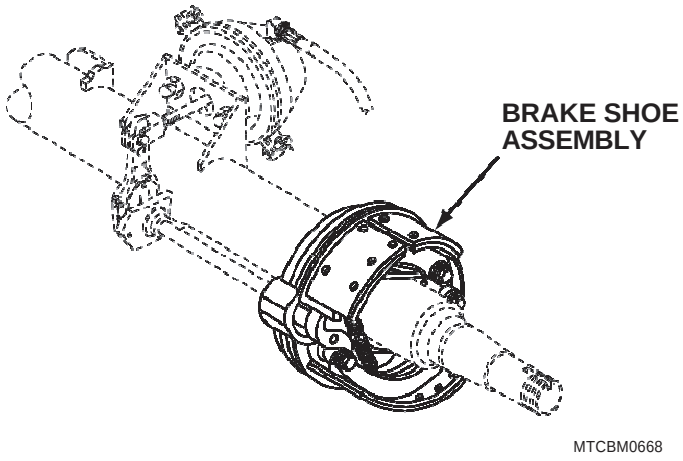


Figure 5. Brake Components.

			Check brake drums for overheating. Look for cracked brake drum. If cracked or damaged replace brake drum, refer to (WP 0135) or (WP 0136). Look for damaged brake camshaft. If damaged, replace (WP 0119). Look for worn brake hoses or damaged brake chamber. If worn or damaged, replace (WP 0125).	

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
9	Semi-Annual	Fire Extinguishers	Remove fire extinguisher from mounting bracket and weigh. Fill out maintenance request DA Form 2407 or exchange request DA Form 2407 for cylinders requiring recharging.	

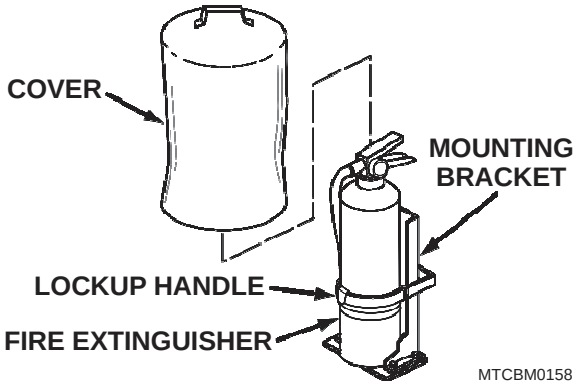


Figure 6. Fire Extinguisher.

			Check that mounting bracket is securely attached to semitrailer. Check that lockup handle moves freely and is not damaged. Check that plastic indicator on top of fire extinguisher is intact. Check to see that safety wire lead or plastic seal is not broken or missing. Check to see that tube is not kinked and nozzle is free of obstructions. Check to see that fire extinguisher tag is securely attached. Check for date of last inspection/recharge. Cover and install fire extinguisher on mounting bracket. Make sure lockup handle holds fire extinguisher securely to mounting bracket.	

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
10	Annual	Towing Connections	Inspect condition of kingpin. Bolt on kingpin or upper coupler (kingpin) plate should be replaced when any of the following conditions exist: Wear of 1/16 in. (1.59 mm) over 1/4 of the circumference of kingpin. This would be a condition of uneven wear on one or more sides of the kingpin wear surface. Even wear over kingpin surface causing the diameter to be reduced by 1/16 in. (1.59 mm). A crack of any size is noted anywhere on pin or associated welds. A nick, chip, or gouge deeper than 1/8 in. (3.18 mm) is noted anywhere on wear surface of pin.	If kingpin coupler plate and/or frame is corroded, cracked, or damaged. Refer to SOUM 13-008.
11	Annual	Wheels and Hubs	Check for cracked wheels or hubs and missing or loose wheel stud nuts.	

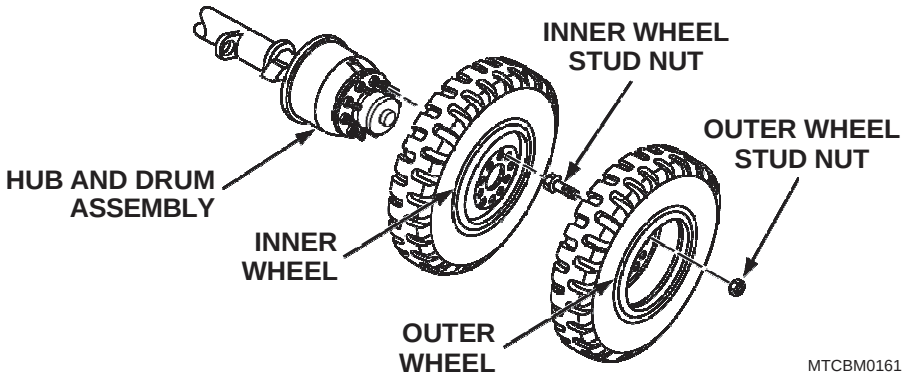


Figure 7. Wheels and Hubs.

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
12	Annual	Wheel Bearings	On all semitrailers visually inspect for grease leakage, seal deterioration, and overall condition of hub and bearings. On semitrailers equipped with stud piloted axles (Figure 8), disassemble hub and drum assembly. Clean, inspect, and pack wheel bearings, refer to (WP 0135) or (WP 0136).	

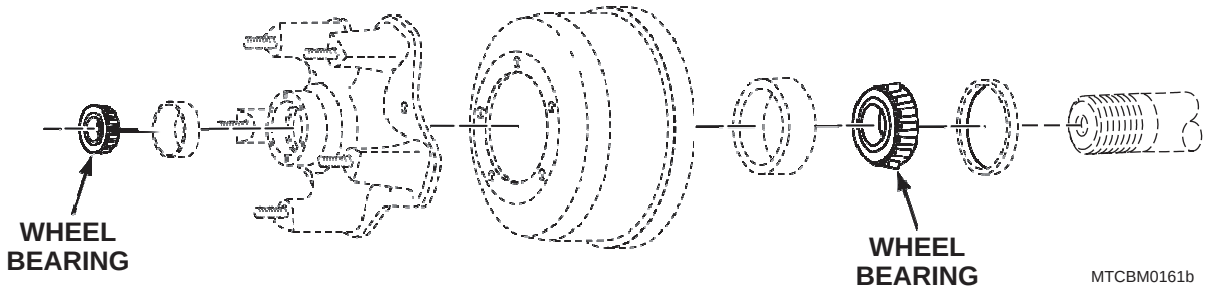


Figure 8. Stud Piloted Wheel.

13	Annual	Wheel Bearings	On semitrailers equipped with hub piloted axles (Figure 9), remove hubs, drums, and wheel bearings. Clean, inspect, and pack wheel bearings, refer to (WP 0135) or (WP 0136).	

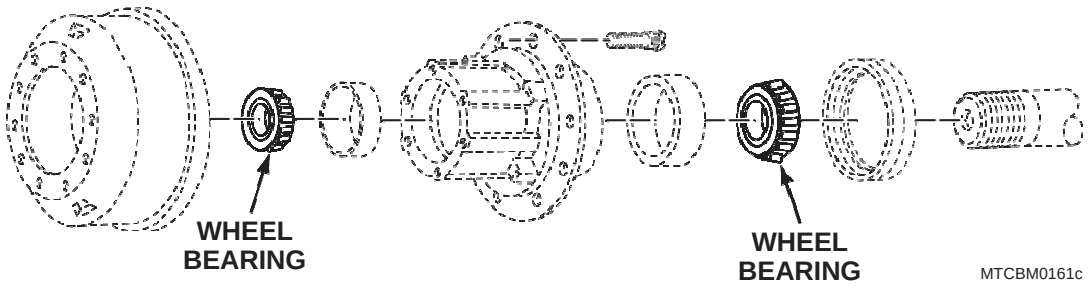


Figure 9. Hub Piloted Wheel.

14	Annual	Vapor Integrity Test	Perform Vapor Integrity Test.	Tanker does not pass test.
15	Every 100 Hours	Engine - Onan	Clean governor linkage.	
16	Every 100 Hours		Change crankcase oil, refer to (WP 0286).	
17	Every 200 Hours		Replace oil filter, refer to (WP 0179).	

Table 1. Preventive Maintenance Checks and Services - Continued.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
18	Every 600 Hours		Change electric fuel pump filters, refer to (WP 0210). Change primary fuel filter, refer to (WP 0218).	
19	Every 300 Hours		Change secondary fuel filter, refer to (WP 0210).	
20	Every 250 Hours	Engine - Lombardini	Replace oil and fuel filters, refer to (WP 0181) or (WP 0210).	
21	Every 500 Hours		Replace fan belt, refer to (WP 0218).	

END OF TASK

END OF WORK PACKAGE

CHAPTER 5

OPERATOR MAINTENANCE INSTRUCTIONS

OPERATOR MAINTENANCE
AIR RESERVOIRS AND DRAINCOCK MAINTENANCE

INITIAL SETUP:

Equipment Condition
Uncouple semitrailer (WP 0007)

WARNING

Particles blown by compressed air can be dangerous. Be certain to direct air stream away from the user and other personnel in the area. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Perform this procedure daily on the uncoupled semitrailer.

DRAINING WATER FROM AIR RESERVOIR

1. Open drain valve (Figure 1, Item 1) on each of two air reservoirs (Figure 1, Item 2) and allow water to flow out.
2. Close drain valve (Figure 1, Item 1) on each of two air reservoirs (Figure 1, Item 2).

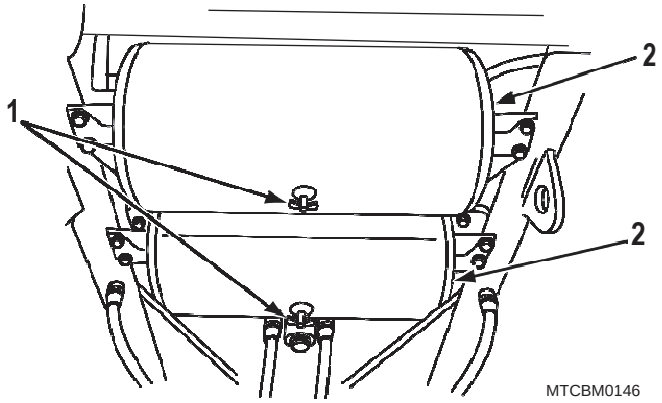


Figure 1. Air Reservoirs.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
SPARE TIRE DISMOUNTING AND MOUNTING

INITIAL SETUP:

Personnel Required
Four

Equipment Condition
Semitrailer uncoupled (WP 0007)

WARNING

- Tire weighs 190 lbs (86.18 kg). Four-person lift or suitable lifting device is required. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- If exchanging bias tires for radial tires, all tires must be changed. DO NOT mix radial and bias tires on tanker. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

DISMOUNTING

NOTE

Step 1 applies to M969A1 and M969A2 Semitrailer tankers only.

1. Remove two quick-release pins (Figure 1, Item 5) and ladder (Figure 1, Item 4).
2. While assistant supports tire (Figure 1, Item 3), remove two nuts (Figure 1, Item 2) and bracket (Figure 1, Item 1).

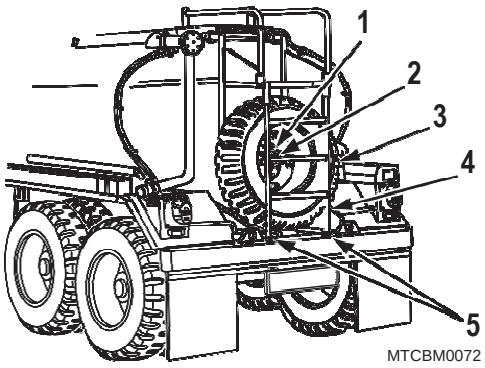


Figure 1. Spare Tire Removal.

3. Using four-person lift or suitable lifting device, lower tire to ground.

END OF TASK

MOUNTING

1. Using four-person lift or suitable lifting device, raise tire to position on back of tanker.
2. While assistant supports tire (Figure 2, Item 3), install bracket (Figure 2, Item 1) and two nuts (Figure 2, Item 2).

NOTE

Step 3 applies to M969A1 and M969A2 Semitrailer tankers only.

3. Install ladder (Figure 2, Item 4) and secure with two quick-release pins (Figure 2, Item 5).

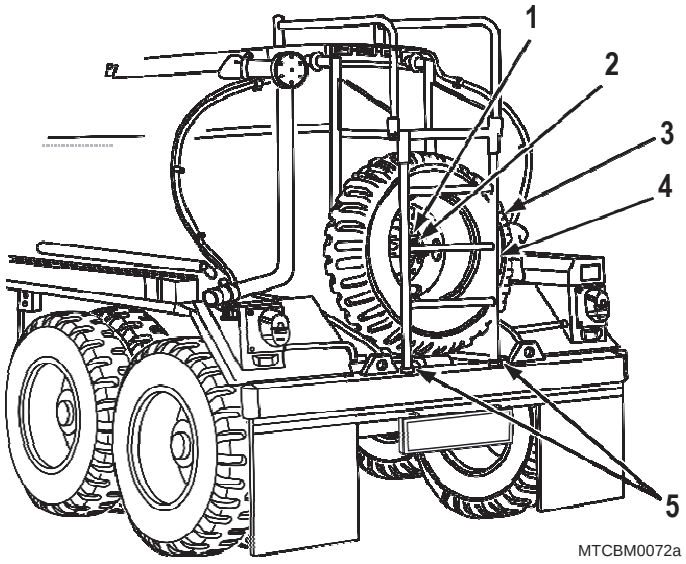


Figure 2. Spare Tire Installation.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
TIRE AND WHEEL ASSEMBLY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 26)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

WARNING

If exchanging bias tires for radial tires, all tires must be changed. DO NOT mix radial and bias tires on tanker. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Position jack under axle (Figure 1, Item 2). Raise semitrailer until tire and wheel assembly (Figure 1, Item 1) is off ground. Support or block axle (Figure 1, Item 2).

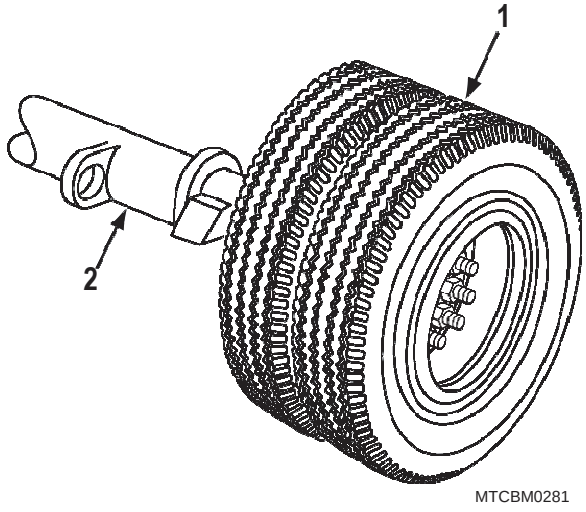


Figure 1. Tire and Wheel Assembly Removal.

REMOVAL - Continued

2. Remove 10 outer stud nuts (Figure 2, Item 5) and outer tire and wheel assembly (Figure 2, Item 4) from hub and drum assembly (Figure 2, Item 1).

NOTE

If inner tire and wheel assembly is being removed, perform Step 3.

3. Remove 10 inner stud nuts (Figure 2, Item 3) and inner tire and wheel assembly (Figure 2, Item 2) from hub and drum assembly (Figure 2, Item 1).

END OF TASK

INSTALLATION

NOTE

If inner tire and wheel assembly was removed, perform Steps 1 through 4. If not, go to Step 5.

1. Install inner tire and wheel assembly (Figure 2, Item 2) on hub and drum assembly (Figure 2, Item 1) and secure with 10 inner stud nuts (Figure 2, Item 3).
2. Lower tire and wheel assembly (Figure 2, Item 2) to ground.

NOTE

For torquing, have Field Maintenance torque stud nuts to 450-500 lb ft (610-678 N·m)

3. Tighten 10 inner stud nuts (Figure 2, Item 3) using the sequence shown in (Figure 2).
4. Raise axle (Figure 2, Item 6) until tire and wheel assembly (Figure 2, Item 2) is off ground.
5. Install outer tire and wheel assembly (Figure 2, Item 4) on hub and drum assembly (Figure 2, Item 1) and secure with 10 outer stud nuts (Figure 2, Item 5).
6. Lower tire and wheel assemblies (Figure 2, Items 2 and 4) to ground. Remove jack.

NOTE

For torquing, have Field Maintenance torque stud nuts to 450-500 lb ft (610-678 N·m)

7. Torque outer stud nuts (Figure 2, Item 5) using the sequence shown in (Figure 2).

INSTALLATION - Continued

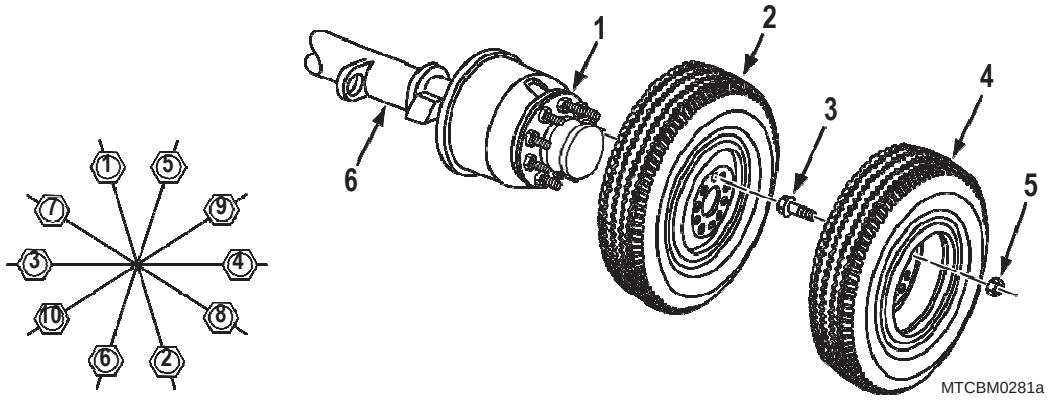


Figure 2. Tire and Wheel Assembly Installation.

END OF TASK

END OF WORK PACKAGE

CHAPTER 6

FIELD MAINTENANCE INSTRUCTIONS

FIELD MAINTENANCE
SERVICE UPON RECEIPT OF MATERIAL

INITIAL SETUP:

Tools and Special Tools
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Materials/Parts
Cloth, Cleaning (WP 0293, Table 1, Item 5)
Rag, Wiping (WP 0293, Table 1, Item 20)
Soap (WP 0293, Table 1, Item 23)
Solvent, Cleaning Compound
(WP 0293, Table 1, Item 25)

References
DA Form 2404

References (cont.)
DA Form 5988-E
DA Pam 750-8
DD Form 1397
WP 0080
WP 0081
WP 0238
WP 0286

GENERAL

When a new, used, or reconditioned semitrailer is first received, determine whether it has been properly prepared for service and is conditioned to perform its mission. Whenever practical, the operator/crew will assist Field Maintenance personnel in the performance of these services. Follow the inspection and servicing instructions below.

INSPECTION INSTRUCTIONS

1. Refer to DD Form 1397 for procedures on unpacking the semitrailer.
2. Remove all straps, plywood, tape, seals, and wrappings.

INSPECTION INSTRUCTIONS - Continued

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

3. Remove rust preventive compound from coated exterior parts of semitrailer using solvent and clean dry rags.
4. Inspect the semitrailer for damage incurred during shipment. Check also to see if the equipment has been modified.
5. Check the equipment against the packing list to make sure that the shipment is complete. Report any discrepancies in accordance with instructions in DA Pam 750-8.

END OF TASK

SERVICING INSTRUCTIONS

Perform the following overall servicing inspections prior to any Field Maintenance.

a. Perform all operator/crew Preventive Maintenance Checks and Services (PMCS) (WP 0080) and all Field PMCS procedures listed in (WP 0081).

b. Lubricate all lubrication points as described in (WP 0286), regardless of interval.

c. Perform a break-in road test of 25 miles (40 km) at a maximum speed of 30 mph (48 km/h).

d. Report any problems on DA Form 2404 or DA Form 5988-E.

CAUTION

- Do not use abrasive powder, steel wool, or other material that will scratch the inside surfaces of the tank. Failure to comply may result in damage to, or destruction of, equipment or mission.
- Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

e. Place a suitable container under all drain valves to remove all preservatives.

f. Perform a depreservation in accordance with DD Form 1397.

g. Open manhole cover to let the tank “air out".

WARNING

DO NOT climb into interior of tank until it has been completely drained and purged and a combustible gas indicator indicates that it is safe. Adequate forced air ventilation or a self-contained breathing apparatus must be used. Any person entering tank must have an attached lifeline. An observer must be stationed at the manhole opening so that assistance may be summoned in the event of an emergency. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

h. Climb into the tank through the manhole and inspect for cleanliness. Remove all sediment and debris using a lint-free cloth.

i. Remove all bands, antitheft bolts, and nuts from hose troughs and fire extinguishers.

j. Remove all tape from exhaust and intake ports of the engine.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

k. Place suitable container under engine fuel tank and remove drain plug. When engine fuel tank is empty, replace drain plug and fill tank with the proper grade of fuel.

SERVICING INSTRUCTIONS - Continued

l. Perform pneumatic leakage test (For procedures, contact: Commander U.S. Tank-Automotive and Armaments Command ATTN: AMSTA-IM-MTT Warren, MI 48397-5000).

m. Remove filters from filter/separator (WP 0238), and replace gasket and access cover. Put about 200 gal (757 L) of the type of fuel to be hauled in the semitrailer tank.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

n. Start the engine and pump fuel through the piping. If fuel fails to flow, prime centrifugal pump (WP 0286). Discharge about 60 gal (227 L) of fuel into suitable container through each hose reel. Discharge remaining fuel through the 4 in. hose(s) into suitable containers.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

o. Stop engine. Open all drain valves and drain residual fuel into containers. Dispose of fuel in accordance with local SOP.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

p. Remove cover and gasket from the filter/separator and install filters (WP 0238). Replace gasket and cover.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
GENERAL

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
AR 200-1
DA Pam 750-8

Materials/Parts
Soap (WP 0293, Table 1, Item 23)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Air reservoirs drain valves open (WP 0082)

Personnel Required
Two

GENERAL

1. This section contains requirements and procedures for the administrative storage of equipment that is issued to and in use by Army Units worldwide.
2. The requirements specified herein are necessary to maintain equipment in administrative storage in such a way as to achieve maximum readiness condition.
3. Equipment that is placed in administrative storage should be capable of being readied to perform its mission within a 24-hour period, or as otherwise prescribed by the approving authority. Before equipment is placed in administrative storage, current Preventative Maintenance Checks and Services (PMCS) procedures should be completed and deficiencies corrected.
4. Report equipment in administrative storage in Materiel Readiness and Unit Readiness reports as prescribed for all reportable equipment in AR 200-1.
5. Perform inspections, maintenance services, and lubrication in accordance with this manual.
6. Records and reports to be maintained for equipment in administrative storage are those prescribed by DA Pam 750-8 for equipment use.
7. A 10 percent variance is acceptable on time, running hours, or mileage used to determine maintenance actions.
8. These maintenance instructions contain general shop practices and specific methods you must be familiar with to maintain your semitrailer. You should read and understand these practices and methods before performing any Field Maintenance tasks.
9. Before beginning a task, find out how much repair, modification or replacement is needed to fix the equipment as described in this manual. Sometimes the reason for equipment failure can be seen right away and complete teardown is not necessary. Disassemble equipment only as far as necessary to repair or replace damaged or broken parts.
10. The following "Initial Setup” information applies to all procedures:
    a. Resources are not listed unless they apply to the procedure.
    b. Personnel are listed only if more than one technician is required to complete the task. If “Personnel Required” is not listed, one technician can complete the task.

GENERAL - Continued

11. All tags and forms attached to equipment must be checked to learn the reason for removal from service. Modification Work Orders (MWO), Safety of Use Messages (SOUM), and Technical Bulletins (TB) must also be checked for equipment changes and updates.
12. In some cases, a part may be damaged by removal. If part appears to be good and other parts behind it are not defective, leave it on and continue with the procedure. Here are a few simple rules:
    a. Do not remove dowel pins or studs unless loose, bent, broken or otherwise damaged.
    b. Do not remove bearings or bushings unless damaged. If you need to remove to access parts behind them, pull bearings and bushings out carefully.
    c. Replace all gaskets, seals and preformed packings.

END OF TASK

AIR SYSTEM LEAK TEST

1. Couple semitrailer to Prime Mover (WP 0007).
2. Close air reservoir drain valves (WP 0082).

NOTE

Initially, brake application will force out a small amount of air. No air should be expelled from air chamber after initial application. If air continues to be expelled from air chamber, replace air chamber.

3. With assistance of helper, apply brakes to semitrailer. Coat flanges and/or connections with soapy water.
4. Inspect flanges and connections for indication of a leak.

CAUTION

Do not overtighten clamp on brake chamber. Overtightening may cause damage to flange. Failure to comply may result in damage to, or destruction of, equipment or mission.

5. If leak is found at connections, tighten connections.

END OF TASK

WORK SAFETY

1. Observe all WARNINGs and CAUTIONs. Always use power tools carefully.
2. Protect yourself against injury. Wear protective gear such as safety goggles or face shield, safety shoes, rubber apron, or gloves.
3. When lifting heavy parts, have someone help you. Make sure that suitable lifting device is working properly, is suitable for the assigned task, and is secure against slipping.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CLEANING AND INSPECTION INSTRUCTIONS

INITIAL SETUP:

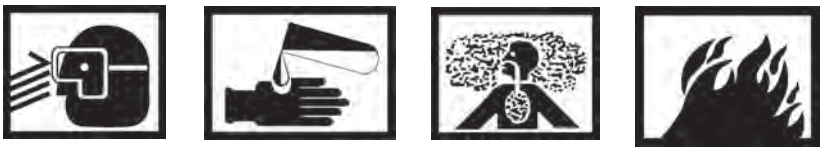
Tools and Special Tools
- Compressor Unit, Reciprocating (WP 0294, Table 1, Item 6)
- Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Materials/Parts
- Brush, Scrub (WP 0293, Table 1, Item 1)
- Cloth, Cleaning (WP 0293, Table 1, Item 5)
- Corrosion Preventive

Materials/Parts (cont.)
- (WP 0293, Table 1, Item 7)
- Rag, Wiping (WP 0293, Table 1, Item 20)
- Soap (WP 0293, Table 1, Item 23)
- Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)

References
- TM 9-214
- TM 9-2610-200-20

WARNING



- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible; DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

CLEANING INSTRUCTIONS

1. **General.**
Cleaning instructions will be the same for a majority of parts and components, which make up the semitrailer. The following should apply to all cleaning, inspection, repair, and assembly operations:

   a. Clean all parts before inspection, after repair, and before assembly.

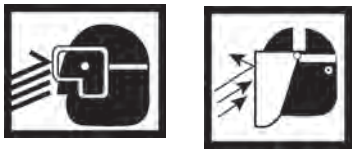
   b. Keep hands free of grease, which can collect dust, dirt, and grit.

   c. After cleaning, all parts should be covered or wrapped to protect them from dust and dirt. Parts that are subject to rust should be lightly oiled.

CLEANING INSTRUCTIONS - Continued

2. **Steam Cleaning.**
   a. Before steam cleaning exterior of semitrailer, protect all electrical equipment, which could be damaged by steam or moisture.
   b. Place disassembled parts in a suitable container to steam clean. Parts that are subject to rust should be dried and lightly oiled after cleaning.
3. **Castings, Forgings, and Machined Metal Parts.**
   a. Clean inner and outer surfaces with solvent.
   b. Remove grease and accumulated deposits with a stiff bristled brush.

WARNING



Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

   c. Clear out all threaded holes with compressed air to remove dirt and cleaning fluids.

CAUTION

Do not wash oil seals, electrical cables and flexible hoses with solvent or mineral spirits. Serious damage or destruction of material would result. Failure to comply may result in damage to, or destruction of, equipment or mission.

4. **Oil Seals, Electrical Cables, and Flexible Hoses.**
   Wash electrical cables and flexible hoses with solution of water and soap and wipe dry.
5. **Bearings.**
   Clean bearings in accordance with TM 9-214.

END OF TASK

INSPECTION INSTRUCTIONS

NOTE

All damaged areas for components and parts should be marked for repair or replacement.

1. All components and parts must be carefully checked to determined if they are serviceable for reuse, can be repaired or must be scrapped.
2. Inspect drilled and tapped (threaded) holes for the following:
   a. Wear, distortion, cracks, and any other damage in or around holes.
   b. Threaded areas for wear distortion (stretching) and evidence of cross-threading.
3. Inspect metal lines, flexible lines (hoses), and metal fittings for the following:
   a. Metal lines for sharp kinks, cracks, bad bends, and dents.

INSPECTION INSTRUCTIONS - Continued

b. Flexible lines for fraying, evidence of leakage, and loose metal fitting or connectors.

c. Metal fittings and connectors for thread damage and worn or rounded hex heads.

4. Inspect castings, forgings, and machined metal parts for the following:

a. Machined surfaces for nicks, burrs, raised metal, wear, and other damage.

b. Inner and outer surfaces for breaks and cracks.

5. Inspect air lines, fittings, and connectors for leaks by coating fittings and connectors with solution of soap and water. No leakage is permissible.

6. Inspect bearings in accordance with TM 9-214.

END OF TASK

CLEANING MATERIALS AND METHODS

1. Use cleaning materials in accordance with TM 9-2610-200-20.

2. Cleaning is normally done by the dip-tank and/or vapor-degreaser methods or by cleaning with cloths soaked in solvent.

END OF TASK

CLEANING OF MATERIAL RECEIVED FROM STORAGE

1. Material received from storage units will be cleaned by the dip-tank, vapor-degreaser or steam method, whichever is applicable or available.

a. **Dip-Tank Method.** Disassemble as required and place parts in a perforated metal basket. Submerge and agitate the basket in a tank containing solvent. Repeat using a second tank with clean solvent. Extent of treatment in each tank will depend on ease with which parts are cleaned.

b. **Vapor-Degreaser Method.** Tanks containing a heated solution of trichloroethylene or perchloroethylene (Type II) are used for degreasing items that are very greasy or oily and are not readily cleaned by the dip-tank method. Place parts in a perforated metal basket and submerge below the vapor in the tank. Keep the basket in this position until all the grease, oil or dirt melts and runs off the parts. If necessary, material may be washed with degreasing spray unit.

c. **Steam Method.** Place parts in a perforated metal basket and steam-treat until clean. This method is less efficient than the vapor-degreaser method and parts may require additional cleaning to remove final traces of grease, oil, or dirt, particularly from recesses.

2. If some time is to elapse before the start of repair or overhaul operation, apply a coat of light grade PE-10 preservative oil to all finished metal surfaces to prevent rusting.

END OF TASK

CLEANING AFTER SHOP INSPECTION

WARNING

Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

After in-process shop inspection, dip parts in a tank containing fingerprint remover oil. Remove parts (with rubber gloves) and dry thoroughly with compressed air or by wiping with clean, lint-free cloths. Apply preservatives as soon as possible after cleaning.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
TAGGING HOSES AND TUBES

INITIAL SETUP:

Not Applicable

TAGGING HOSES AND TUBES

1. As soon as first hose or tube is disconnected, write number "1" on two tags. Secure one tag to hose or tube and the other tag to nipple or fitting. After disconnecting second hose or tube, write number "2" on two tags. Secure one tag to hose or tube and second tag to nipple or fitting. Do the same for all hoses and tubes.
2. Using writing utensil, note which numbers you need on the art in this manual. This will help you re-tag properly when you remove tags from some parts to perform cleaning and maintenance work.
3. Remove all tags when finished.

END OF WORK PACKAGE

FIELD MAINTENANCE
PAINTING AND STENCILING

INITIAL SETUP:

References
TB 43-0209
TM 43-0139

WARNING

Make sure grounding studs are installed on clean, unpainted metal surface. If mounting surface is painted, scrape off paint to bare metal. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

PAINTING AND STENCILING

General instructions are included in TM 43-0139 and TB 43-0209.

Spot painting and stenciling (marking) of tactical vehicles will be performed under the control of Field Maintenance personnel.

NOTE

To ensure proper bonding and grounding connections, DO NOT paint the semitrailer's grounding studs.

Painting of a complete tactical vehicle can be authorized and performed only by Field or higher support elements.

PAINTING AND STENCILING - Continued

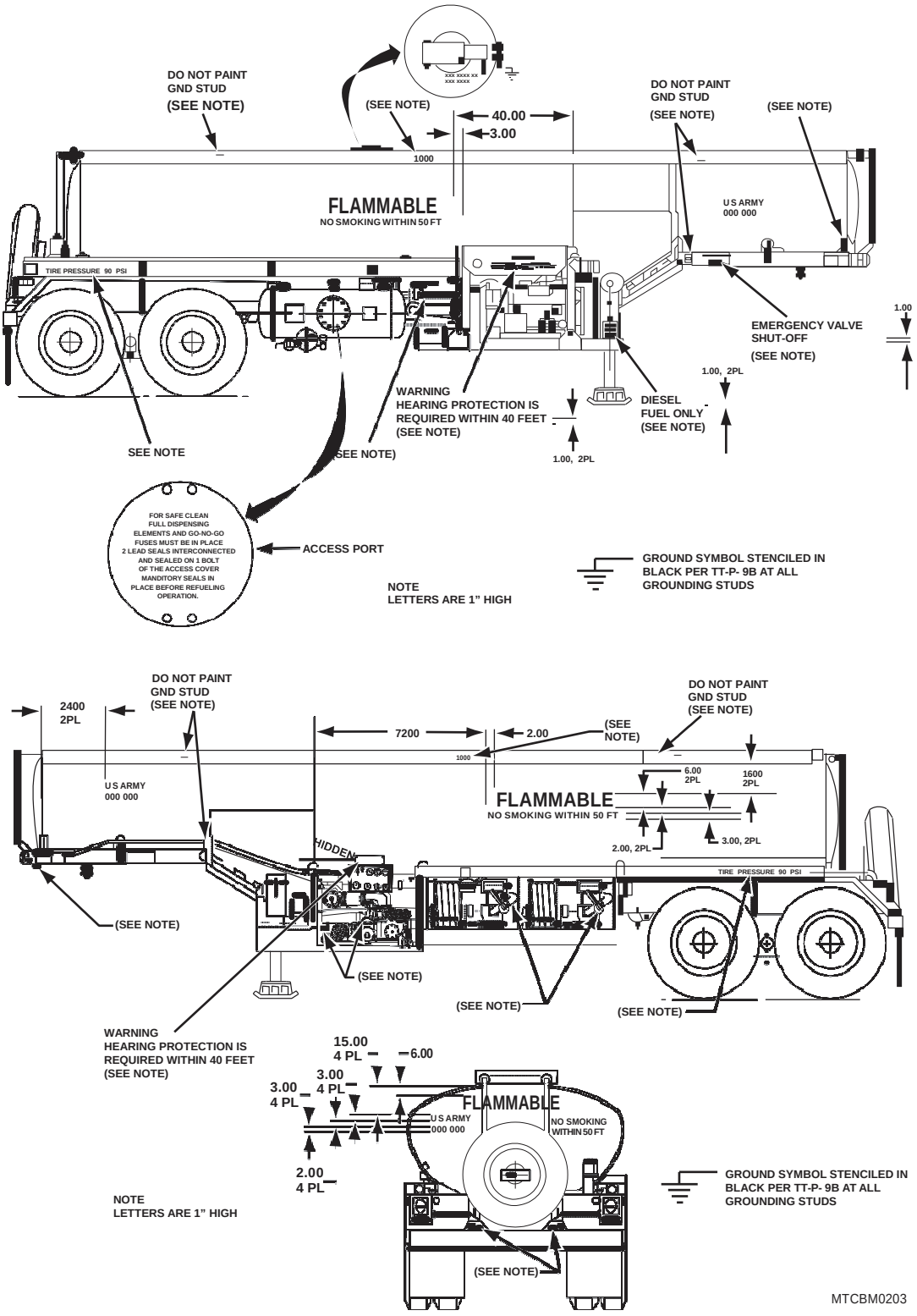


Figure 1. M969A1 and M969A2 Typical Stenciling.

PAINTING AND STENCILING - Continued

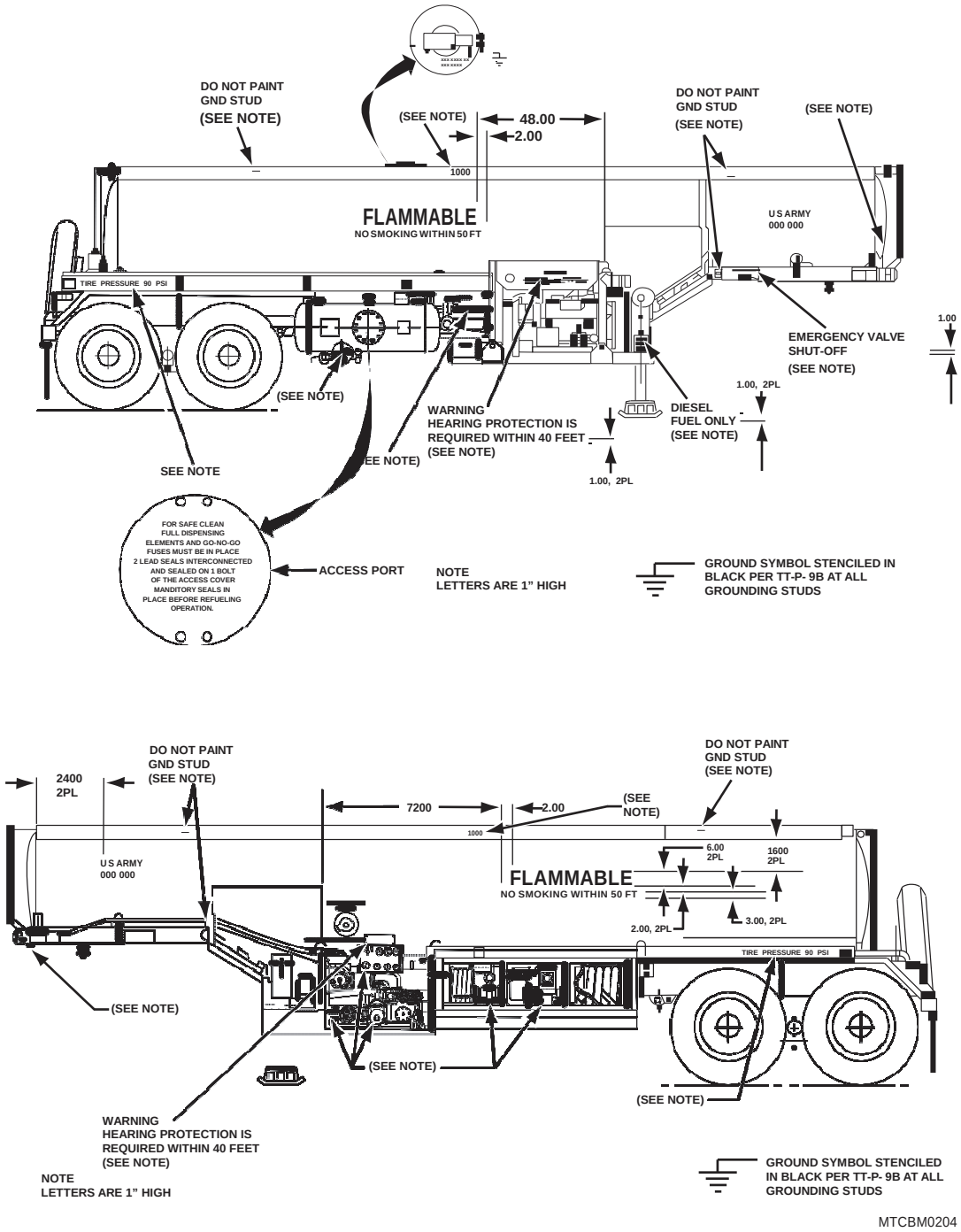


Figure 2. M970A1 Typical Stenciling.

PAINTING AND STENCILING - Continued

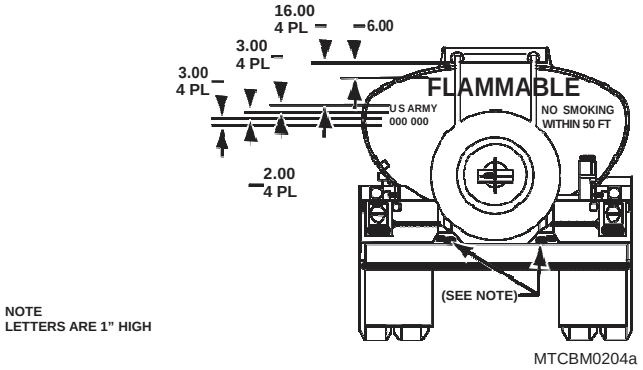


Figure 3. M970A1 Typical Stenciling.

END OF WORK PACKAGE

FIELD MAINTENANCE
ADMINISTRATIVE STORAGE AND SHIPMENT

INITIAL SETUP:

References
AR 190-13
AR 190-51
AR 220-1
AR 700-138
AR 750-1
DA Form 2404
DA Form 5988-E

References (cont.)
DA Pam 750-8
DD Form 314
DD Form 1397
SF Form 364
TM 55-2200-001-12
TM 743-200-1

DEFINITION OF ADMINISTRATIVE STORAGE

Equipment placement in administrative storage can be for short periods when:

- Units lack operating funds, personnel, other resources, or normal usage of the organic materiel.
- Materiel exceeding the owning Unit's capability for operation and maintenance must be retained by that Unit for contingency or other reasons.

Installation or Unit commanders may authorize the administrative storage of their materiel through guidance furnished in AR 750-1.

PREPARATION FOR ADMINISTRATIVE STORAGE

Except as indicated elsewhere in this paragraph, equipment placed in administrative storage should be capable of mission readiness within a 24-hour period or as otherwise prescribed by the approving authority. Before equipment is placed in administrative storage, current maintenance services, shortcomings, and deficiencies should be corrected and all Modification Work Orders (MWOs), Technical Bulletins (TBs), and Safety of Use Messages (SOUMs) should be applied.

Report equipment in administrative storage in Materiel Readiness and Unit Readiness reports as prescribed for all reportable equipment. Refer to AR 700-138 and AR 220-1.

Perform inspections, maintenance services, and lubrication in accordance with this manual.

Records and reports to be maintained for equipment in administrative storage are those prescribed by DA Pam 750-8, for equipment in use.

Ten percent variance is acceptable on running time hours or mileage used to determine maintenance actions involved.

Security

Instructions in this paragraph do not modify security procedures and requirements for classified or pilferable items. Refer to AR 190-13 and AR 190-51.

Storage Site

Select the best available site for administrative storage. Separate stored equipment from equipment in use. Conspicuously mark the area “Administrative Storage.”

PREPARATION FOR ADMINISTRATIVE STORAGE - Continued

Storage Site - Continued

Covered storage space is preferred. When sufficient covered space is unavailable for all semitrailers to be stored, select an open site.

Open sites should be improved, if available. Unimproved sites should be firm, well-drained, and kept free of excessive vegetation.

Storage Plan

Store equipment to provide maximum protection from the elements and to provide access for inspection, maintenance, and exercising. Anticipate removal or deployment problems and take suitable precautions.

Take into account environmental conditions, such as extreme heat or cold, high humidity, blowing sand, dust or loose debris, soft ground, mud, heavy snows, earthquakes, or combinations thereof and take adequate precautions.

Establish a fire plan and provide adequate firefighting equipment and personnel.

Maintenance Services and Inspections

Prior to storage, perform the next scheduled major preventive maintenance services (semiannually or annually).

Basic Issue Items

Process basic issue items simultaneously with the semitrailer to which they are assigned. If possible, store basic issue items with the semitrailer. If stored apart from the semitrailer, label basic issue items with tags designating the vehicle the registration or serial number and location, and store in protective closures. In addition, place a tag or list indicating the location of the removed items in a conspicuous place in the semitrailer.

Corrections of Shortcomings and Deficiencies

1. Correct all shortcomings and deficiencies prior to storage or obtain a determined from the approving authority.
2. A vehicle to be prepared for administrative storage must be given a limited technical inspection and be processed as prescribed on DD Form 1397. The result of the inspection and classification will be entered on DA Form 2404 or DA Form 5988-E.

END OF TASK

CARE OF EQUIPMENT IN ADMINISTRATIVE STORAGE

Maintenance Services

After equipment has been placed in administrative storage, suspend all regularly scheduled Preventive Maintenance Checks and Services (PMCS), inspections, and exercises as specified in this chapter.

Inspection

A vehicle to be prepared for administrative storage must be given a limited technical inspection and be processed as prescribed on DD Form 1397. The result of the inspection and classification will be entered on DA Form 2404 or DA Form 5988-E.

If a vehicle is not shipped or issued upon expiration of the administrative storage period, process as applicable in accordance with the appropriate vehicle specification.

CARE OF EQUIPMENT IN ADMINISTRATIVE STORAGE - Continued

Inspection - Continued

If a vehicle to be shipped will reach its destination within the administrative storage period, it need not be reprocessed when removed from storage, unless necessary because of anticipated in-transit weather conditions.

- Low or flat tires and leaks (coolant, fuel, or oil).
- Condition of preservation, seals and wraps. Seals may develop leaks during storage, during exercise or shortly thereafter. If leaking continues, refer to the repair procedure in this manual.
- Corrosion or other deterioration.
- Damaged or missing parts.
- Water in compartments.
- Any other readily recognizable shortcomings or deficiencies.

Inspection will be visual and must consist of a walk-around examination of all equipment to observe any deficiencies that may have occurred. Inspect equipment in open storage weekly and equipment in covered storage monthly. Immediately after any severe storm or environmental change, inspect all equipment. The following are examples of things to look for during visual inspection:

REMOVAL FROM ADMINISTRATIVE STORAGE

Remove preservative materials. Perform the next scheduled maintenance service and prepare equipment for service in accordance with instructions on DD Form 1397, and instructions in this manual.

Resume the maintenance service schedule in effect after the commencement of storage in accordance with DD Form 314, (refer to DA Pam 750-8).

END OF TASK

PREPARATION OF EQUIPMENT FOR SHIPMENT

For additional instructions on processing, storage, and shipment of material refer to TM 743-200-1.

Trailers that have been removed from storage for shipment do not have to be reprocessed if they will reach their destination within the administrative storage period. Reprocess only if inspection reveals any corrosion or if anticipated in-transit weather conditions make it necessary.

When a trailer is received and has already been processed for domestic shipment, as indicated on DD Form 1397, the trailer does not have to be reprocessed for storage unless corrosion and deterioration are found during the inspection upon receipt. List, on SF Form 364, all discrepancies found because of poor preservation, packaging, packing, marking, handling, loading, storage, or excessive preservation. Repairs that cannot be handled by the receiving unit must have tags attached listing the needed repairs. A report of these conditions will be submitted by the unit commander for action by a maintenance unit.

When shipping the semitrailer, the officer in charge of preparing the shipment will be responsible for furnishing the material in serviceable condition, properly cleaned, processed, packaged, and packed. Transport the semitrailer in accordance with TM 55-2200-001-12.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
GENERAL MAINTENANCE PROCEDURES

INITIAL SETUP:

Tools and Special Tools
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Materials/Parts
Cloth, Cleaning (WP 0293, Table 1, Item 5)
Solvent, Cleaning Compound

Materials/Parts (cont.)
(WP 0293, Table 1, Item 25)

References
TC 9-237
TM 9-214

WORK AREA

1. Make sure the work area is clean before you disassemble the pump or engine.
2. Make sure that materials needed for the maintenance task are at hand. These may include cleaning solvents, lubricants, buckets, or other containers for cleaning or for keeping components separated, clean wiping cloths, and the proper tools.

END OF TASK

CLEANING OF COMPONENTS, ASSEMBLIES OR PARTS

CAUTION

To prevent damage to machine-surfaced parts, make sure to clean exterior of component or assembly before disassembly. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Clean exterior of component or assembly before disassembly to keep foreign matter from bearings, gears, and other machine-surfaced parts that are subject to scoring and other such damage.

WARNING

Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

2. If compressed air is used to clean parts, make sure it is free of dirt and other contaminants.
3. Protect disassembled parts from dust, blowing sand, and moisture, which can cause rapid wear and deterioration of bearings, gears, and other machine parts.

END OF TASK

GENERAL INSTRUCTIONS

1. In disassembly, remove only as many parts or components as required for indicated repair. Complete disassembly of a component is not always required to make repairs. Good judgment should be used to keep disassembly operations to a minimum.
2. During disassembly, tag critical parts to ensure proper reassembly. Mark mating parts by scribe marks or indelible ink to be certain of correct positioning at assembly.
3. Unserviceable or unrepairable assemblies will be broken down into items of issue and serviceable parts will be returned to stock. Parts or assemblies that cannot be repaired, selective fitted, or reclaimed to standards contained in this manual will be salvaged and replaced with new parts.
4. If a required new part is not available, reconditioning of the old part is necessary. Such parts should be inspected carefully after reconditioning to determine their suitability and probable service life. Replacement parts should be requisitioned immediately.
5. Replace seals and gaskets of all components that were disassembled.
6. Replace springs if broken, distorted, or cracked or if they do not conform to specific tensile standards.
7. Replace screws or nuts having damaged threads or rounded corners. Replace lock washers.
8. Replace keys if damaged.
9. During assembly, subassemblies should be assembled first. The subassemblies can then be combined into major components and installed to make a complete major assembly.

END OF TASK

CARE OF BEARINGS

WARNING

- Cleaning solvent compound MIL-PRF-680 is toxic and flammable. ALWAYS wear protective eyewear and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes and do not breathe vapors. Do not use near open flame or excessive heat. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Compressed air used for cleaning or drying purposes should not exceed 30 psi (207 kPa). Use compressed air only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves) and exercise caution. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

CARE OF BEARINGS - Continued

NOTE

Refer to TM 9-214 for further information on the inspection, care, and maintenance of bearings.

1. Clean ball and roller bearings by placing them in a wire basket and immersing in a container of fresh solvent. Agitate bearings in solvent to remove all traces of old lubricant.
2. After cleaning the bearings, dry them with clean compressed air. Take care to prevent spinning the bearings when using a compressed air jet.
3. Dip cleaned bearings in clean engine oil and immediately wrap them in a lint-free cloth to protect them from dust and other foreign matter.

END OF TASK

WELDING

1. Read and observe all safety precautions in the Warning Summary before performing any welding operation.
2. All welds must reflect good workmanship and approved welding procedures. Welds must be secure and free from cracks, excessive spatter and obvious defects. For welding instructions and materials refer to TC 9-237.

END OF TASK

SURFACE PROTECTION

1. Clean and repaint all surfaces on which paint has deteriorated or become damaged.
2. Do not paint grounding studs or electrical harnesses or leads.
3. Paint exterior of vehicle in olive drab.

END OF TASK

REPAIRING DAMAGED THREADS

1. When determined feasible by inspection, damaged threads should be repaired by retapping by use of a thread die or a thread restorer file.
2. Tapped holes for screw thread inserts that have mutilated threads may be repaired by either of the following methods:
   a. Drilling and tapping holes oversize, then installing larger screws.
   b. Filling tapped hole by welding, then redrilling and tapping hole to original size.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
MARKER LIGHT MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

Materials/Parts
Felt, Mechanical (WP 0295, Table 1, Item 92)

NOTE

Semitrailers M967A1 SN TA-103 thru TA-522, and M969A1 SN TB-103 thru TB-520 have a Light Emitting Diode (LED) in their marker lights. Remaining semitrailers have an incandescent lamp in marker lights. Replacement of LED and lamp is common.

REMOVAL

1. Remove two screws (Figure 1, Item 6), nuts plates (Figure 1, Item 3), lens housing (Figure 1, Item 5), and lens (Figure 1, Item 4) from marker light body (Figure 1, Item 1).
2. Remove lamp (Figure 1, Item 2) from marker light body (Figure 1, Item 1).

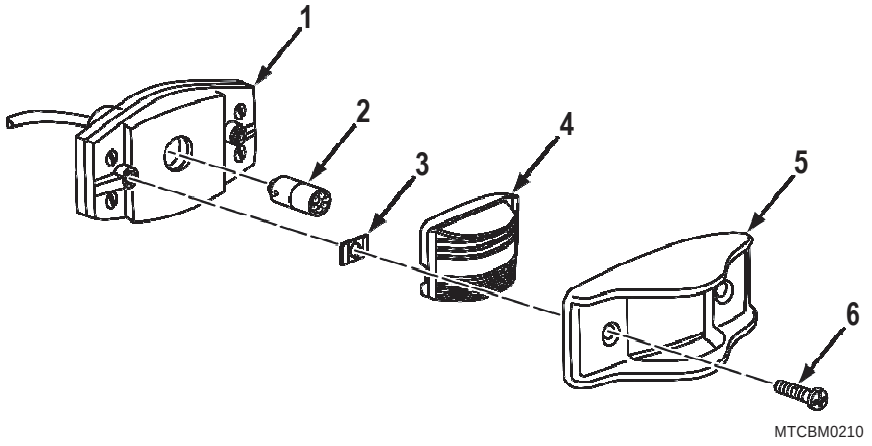


Figure 1. Marker Light Removal.

END OF TASK

DISASSEMBLY

1. Remove four screws (Figure 2, Item 11) and washers (Figure 2, Item 12) from marker light body (Figure 2, Item 1).
2. Disconnect marker light lead (Figure 2, Item 4) and remove marker light body (Figure 2, Item 5), lead (Figure 2, Item 2), and felt (Figure 2, Item 3) from semitrailer. Discard felt (Figure 2, Item 3).
3. Remove washer (Figure 2, Item 1) and shell (Figure 2, Item 2) from marker light lead (Figure 2, Item 4).

END OF TASK

ASSEMBLY

1. Install shell (Figure 2, Item 2) and washer (Figure 2, Item 1) in marker light lead (Figure 2, Item 2).
2. Install new felt (Figure 2, Item 3), marker light lead (Figure 2, Item 4), and body (Figure 2, Item 5) on semitrailer with four screws (Figure 2, Item 11) and washers (Figure 2, Item 12).

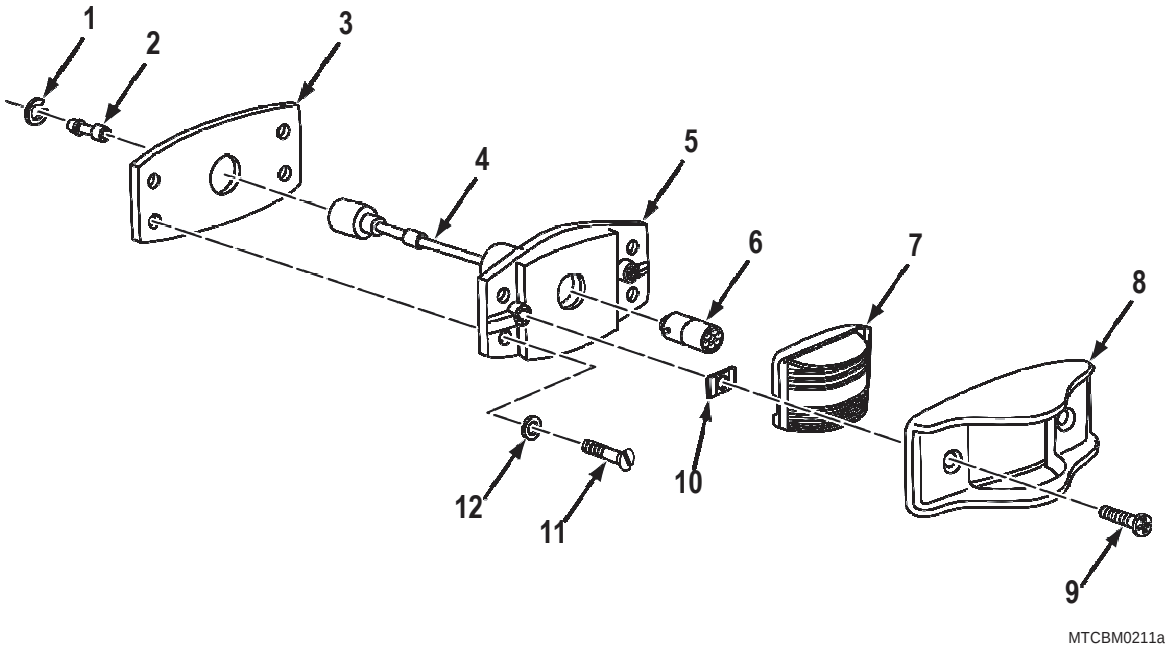


Figure 2. Marker Light Assembly.

END OF TASK

INSTALLATION

1. Install lamp (Figure 2, Item 6) in marker light body (Figure 2, Item 5).
2. Install lens (Figure 2, Item 7) and lens housing (Figure 2, Item 8) on marker light body (Figure 2, Item 5) with two screws (Figure 2, Item 9) and nuts plates (Figure 2, Item 10).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LIGHT EMITTING DIODE (LED) MARKER LIGHT REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

NOTE

There are eleven marker light LEDs (seven red and four amber). The marker light LEDs are replaced the same way.

1. Remove two screws (Figure 1, Item 4) and marker light LED cover (Figure 1, Item 3).
2. Disconnect LED wire connector (Figure 1, Item 2) from back of LED cover (Figure 1, Item 3).
3. Remove four screws (Figure 1, Item 5), four washers (Figure 1, Item 6), and marker light receptacle (Figure 1, Item 1).

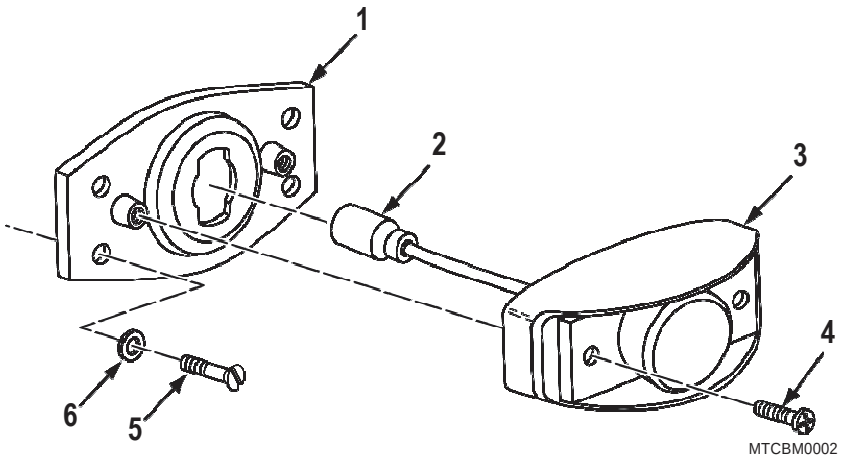


Figure 1. LED Marker Light Removal.

END OF TASK

INSTALLATION

1. Install marker light receptacle (Figure 2, Item 1), four washers (Figure 2, Item 6), and four screws (Figure 2, Item 5).
2. Connect LED wire connector (Figure 2, Item 2) to back of marker light LED cover (Figure 2, Item 3).
3. Install marker light LED cover (Figure 2, Item 3) and two screws (Figure 2, Item 4).

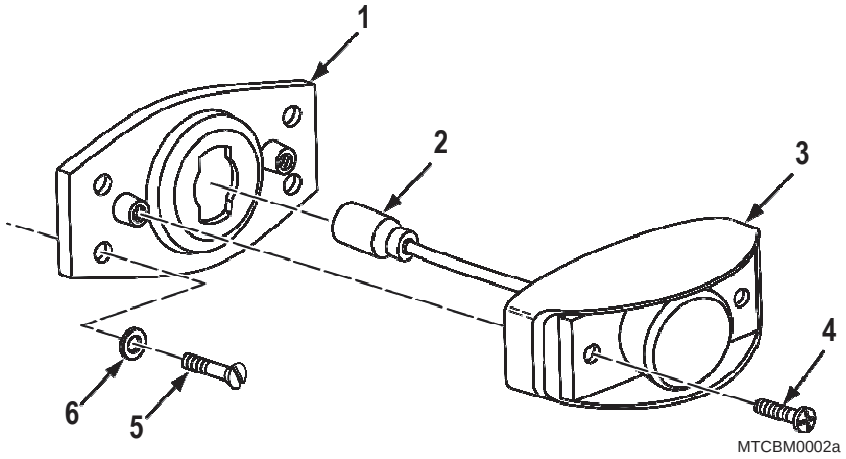


Figure 2. LED Marker Light Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
STOP, TAIL, AND BLACKOUT LIGHT MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 27)
Nuts, Self-Locking

Materials/Parts (cont.)
Qty: (6) (WP 0295, Table 1, Item 171)
Tag, Marker (WP 0293, Table 1, Item 28)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Semitrailer bonded and grounded (WP 0098)

REMOVAL

NOTE

- This procedure covers one stoplight. All stoplights are replaced the same way.
- Tag all wires connectors prior to disconnecting if they are not already identified or if metal ID band is missing or not readable.

1. Remove seven screws (Figure 1, Item 3), cover plate (Figure 1, Item 1), and gasket (Figure 1, Item 2) from semitrailer. Discard gasket (Figure 1, Item 2).

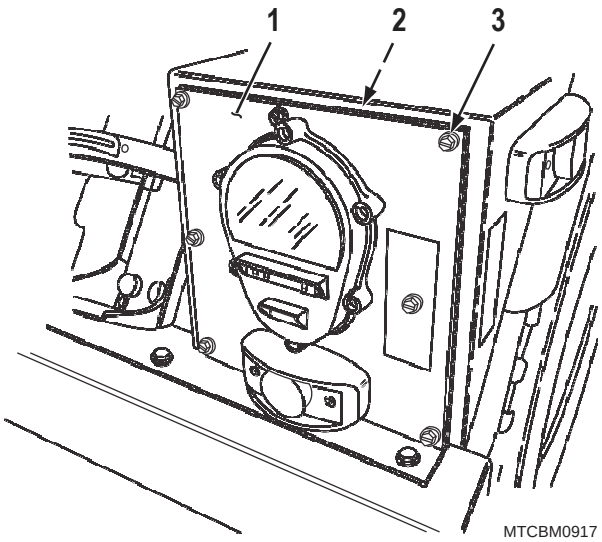


Figure 1. Composite Stoplight Removal.

REMOVAL - Continued

2. Disconnect semitrailer wiring harness connectors (Figure 2, Item 5) from composite stoplight wire lead connectors (Figure 2, Item 6).
3. Remove six self-locking nuts (Figure 2, Item 2), washers (Figure 2, Item 3), and composite stoplight (Figure 2, Item 1) from cover plate (Figure 2, Item 4). Discard self-locking nuts (Figure 2, Item 2).

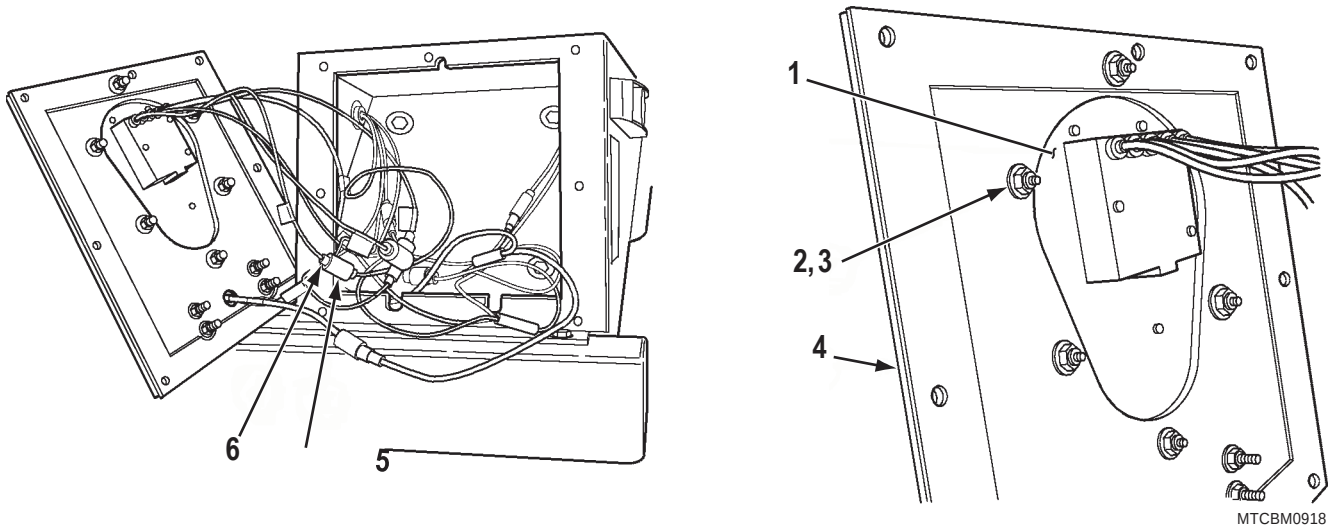


Figure 2. Composite Stoplight Wiring Harness.

END OF TASK

INSTALLATION

1. Install composite stoplight (Figure 2, Item 1), six new locknuts (Figure 2, Item 2), and washers (Figure 2, Item 3) to cover plate (Figure 2, Item 4).
2. Connect composite stoplight lead wire connectors (Figure 2, Item 6) to semitrailer wiring harness connectors (Figure 2, Item 5).
3. Install new gasket (Figure 3, Item 2), cover plate (Figure 3, Item 1), and seven screws (Figure 3, Item 3).

INSTALLATION - Continued

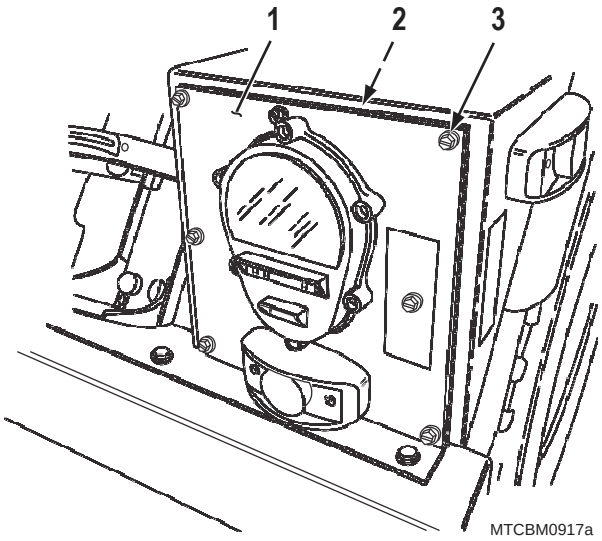


Figure 3. Composite Stoplight Installation.

END OF TASK

FOLLOW ON TASK

Disconnect semitrailer grounding cables (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CONTROL PANEL LIGHT ASSEMBLY MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 177)
O-Ring (WP 0295, Table 1, Item 127)

References
WP 0004

References (cont.)
WP 0098
WP 0146

Equipment Condition
Negative battery cable disconnected (WP 0098)
Open engine control panel (WP 0004)
Remove roadside hose trough access cover
(WP 0145)
Semitrailer uncoupled (WP 0007)

LIGHT ASSEMBLY LAMP REMOVAL

1. Remove lens (Figure 1, Item 10) and O-ring (Figure 1, Item 8) from light assembly (Figure 1, Item 5). Discard O-ring (Figure 1, Item 8).
2. Remove lamp (Figure 1, Item 9) from light assembly (Figure 1, Item 5).

END OF TASK

LIGHT ASSEMBLY LAMP INSTALLATION

1. Install lamp (Figure 1, Item 9) in light assembly (Figure 1, Item 5).
2. Install lens (Figure 1, Item 10) and new O-ring (Figure 1, Item 8) on light assembly (Figure 1, Item 5).

END OF TASK

LIGHT ASSEMBLY REMOVAL

NOTE

Step 1 of Light Assembly Lamp Removal is required to remove light assembly.

1. Remove two screws (Figure 1, Item 6), self-locking nuts (Figure 1, Item 7), and control panel light assembly (Figure 1, Item 5) from semitrailer. Discard self-locking nuts (Figure 1, Item 7).
2. Remove conduit adapter (Figure 1, Item 3) from light assembly (Figure 1, Item 5).
3. Remove wire (Figure 1, Item 4) from light assembly (Figure 1, Item 5).

END OF TASK

LIGHT ASSEMBLY INSTALLATION

1. Install wire (Figure 1, Item 4) on light assembly (Figure 1, Item 5).
2. Install conduit adapter (Figure 1, Item 3) to light assembly (Figure 1, Item 5).
3. Install control panel light assembly (Figure 1, Item 5) on semitrailer with two screws (Figure 1, Item 6) and new self-locking nuts (Figure 1, Item 7).
4. Install lens (Figure 1, Item 10) and new O-ring (Figure 1, Item 8) on light assembly (Figure 1, Item 5).

END OF TASK

CONTROL PANEL LIGHT CONDUIT REMOVAL

NOTE

Step 2 of Light Assembly Removal is required to remove control panel light conduit.

1. Disconnect terminal (Figure 1, Item 13) from control panel wiring harness (Figure 1, Item 11).
2. Remove terminal (Figure 1, Item 13), washer (Figure 1, Item 14), and shell (Figure 1, Item 15) from conduit (Figure 1, Item 2).
3. Remove conduit adapter (Figure 1, Item 1) and conduit (Figure 1, Item 2) from control panel (Figure 1, Item 12).

END OF TASK

CONTROL PANEL LIGHT CONDUIT INSTALLATION

1. Install conduit (Figure 1, Item 2) and conduit adapter (Figure 1, Item 1) on control panel (Figure 1, Item 12).
2. Install conduit adapter (Figure 1, Item 3) to light assembly (Figure 1, Item 5).
3. Install shell (Figure 1, Item 15), washer (Figure 1, Item 14), and terminal (Figure 1, Item 13) on conduit (Figure 1, Item 2).
4. Connect terminal (Figure 1, Item 13) to control panel wiring harness (Figure 1, Item 11).

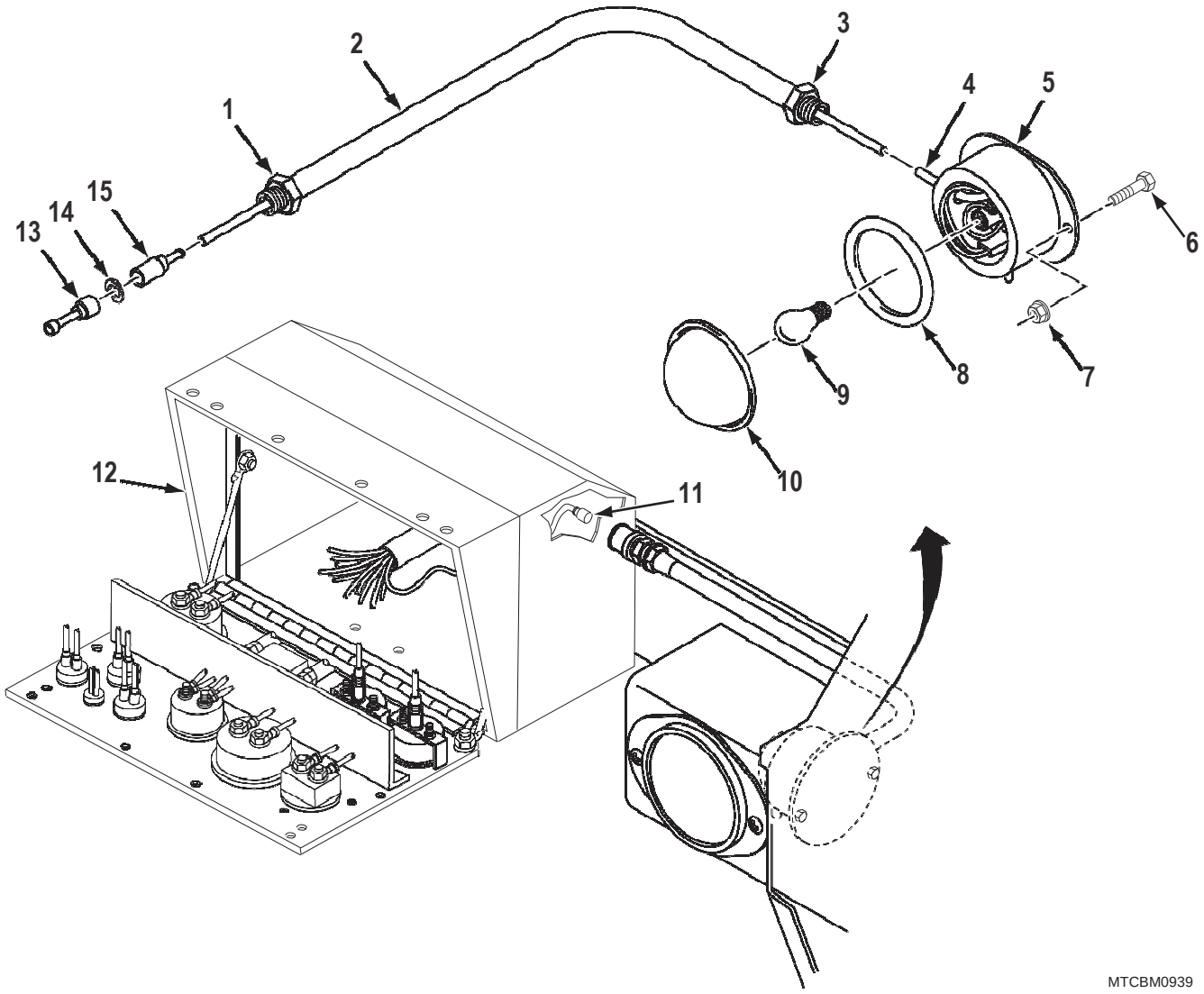


Figure 1. Control Panel Light Maintenance.

END OF TASK

FOLLOW ON TASK

1. Reinstall roadside hose trough access cover (WP 0145).
2. Close engine control panel (WP 0004).
3. Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BATTERIES, TERMINALS, AND CABLES MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Equipment Condition
Semitrailer uncoupled (WP 0007)

Materials/Parts
Baking Soda (WP 0293, Table 1, Item 24)

WARNING

- Batteries produce explosive gases. Keep sparks, flame, and smoking material away. Ventilate when charging or using in an enclosed space. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Batteries contain sulfuric acid that causes severe burns. If acid contacts eyes, skin, or clothing, flush well with water. For contact with eyes, get immediate medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Before each time vehicle is put into operation, battery terminals and cables should be inspected for excessive dirt and corrosion, loose connections, and damage. Dirt, combined with electrolyte or moisture on top of battery, can result in a continuous battery discharge.

INSPECTION AND SERVICE

1. Remove four wingnuts (Figure 1, Item 2) and washers (Figure 1, Item 3) securing battery cover (Figure 1, Item 4) to battery hold-down bracket. Remove battery cover (Figure 1, Item 4) from hold-down bracket.
2. Inspect battery area for excessive dirt and corrosion. Clean battery area with mixture of baking soda and water, then flush battery area with clean water.
3. Check four cables (Figure 1, Item 1) for frayed insulation. If insulation is worn or frayed, replace.

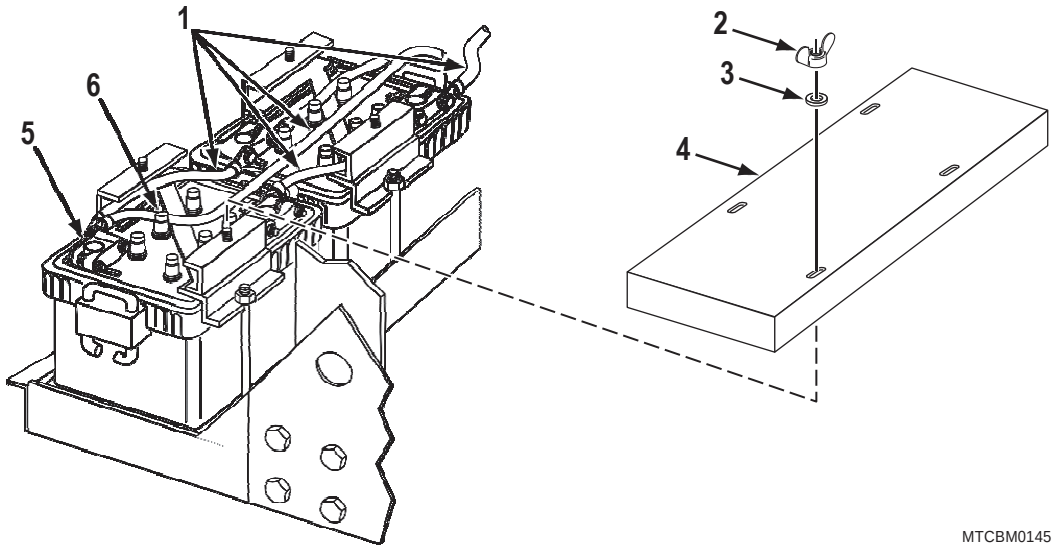


Figure 1. Batteries, Terminals, and Cables.

4. Check terminals (Figure 1, Item 5) for looseness. If loose, tighten.
5. Remove 12 vent fill caps (Figure 1, Item 6) and check electrolyte level. Electrolyte level must be just below ring at bottom of each cell opening. If electrolyte level is low, notify Supervisor. Install 12 vent fill caps (Figure 1, Item 5).
6. Install battery cover (Figure 1, Item 4) on hold-down bracket with four wing nuts (Figure 1, Item 2) and washers (Figure 1, Item 3).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BATTERY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Equipment Condition
Semitrailer uncoupled WP 0007

WARNING

- Batteries produce explosive gases. Keep sparks, flame, and smoking material away. Ventilate when charging or using in an enclosed space. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Batteries contain sulfuric acid that causes severe burns. If acid contacts eyes, skin, or clothing, flush well with water. For contact with eyes, get immediate medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove four wing nuts (Figure 1, Item 1), washers (Figure 1, Item 2), and cover (Figure 1, Item 3) from two battery retainers (Figure 1, Item 4).
2. Loosen two screws (Figure 1, Item 7) on negative battery terminals (Figure 1, Item 8). Remove terminals (Figure 1, Item 8) from batteries (Figure 1, Item 6).
3. Loosen two screws (Figure 1, Item 9) on positive battery terminals (Figure 1, Item 10). Remove terminals (Figure 1, Item 10) from batteries (Figure 1, Item 6).
4. Remove four nuts (Figure 1, Item 11), eight washers (Figure 1, Item 12), two battery retainers (Figure 1, Item 4), and four hook bolts (Figure 1, Item 5) from batteries (Figure 1, Item 6).
5. Remove two batteries (Figure 1, Item 6) from semitrailer.

END OF TASK

INSTALLATION

1. Install two batteries (Figure 1, Item 6) on semitrailer.
2. Install four hook bolts (Figure 1, Item 5), two battery retainers (Figure 1, Item 4), eight washers (Figure 1, Item 12), and four nuts (Figure 1, Item 11) on batteries (Figure 1, Item 6).
3. Install two positive battery terminals (Figure 1, Item 10) on batteries (Figure 1, Item 6). Tighten two screws (Figure 1, Item 9) on terminals (Figure 1, Item 10).
4. Install two negative battery terminals (Figure 1, Item 8) on batteries (Figure 1, Item 6). Tighten two screws (Figure 1, Item 7) on terminals (Figure 1, Item 8).
5. Install cover (Figure 1, Item 3) on two battery retainers (Figure 1, Item 4) with four wing nuts (Figure 1, Item 1) and washers (Figure 1, Item 2).

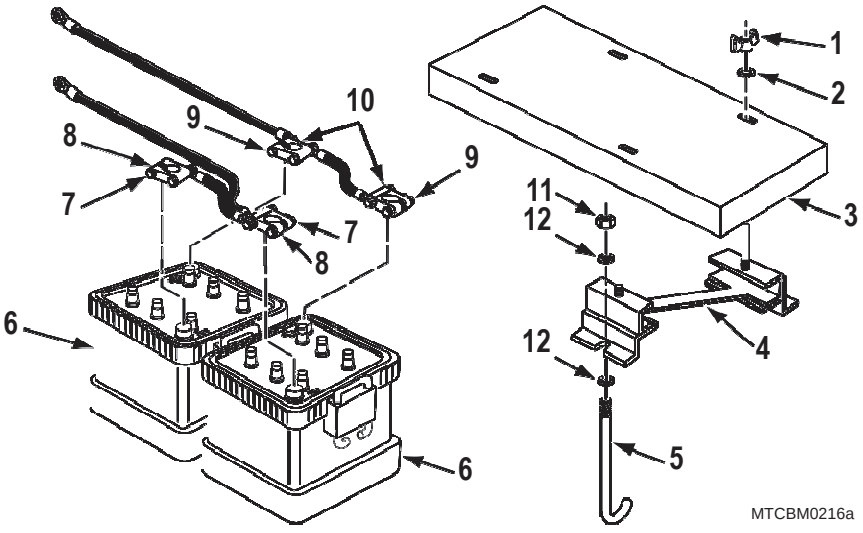


Figure 1. Battery Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BATTERY CABLE REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Equipment Condition
Semitrailer uncoupled (WP 0007)

WARNING

- Batteries produce explosive gases. Keep sparks, flame, and smoking material away. Ventilate when charging or using in an enclosed space. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Batteries contain sulfuric acid that causes severe burns. If acid contacts eyes, skin, or clothing, flush well with water. For contact with eyes, get immediate medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove fasteners (Figure 1, Item 3) and two leads (Figure 1, Items 1 and 2) from terminal (Figure 1, Item 4).

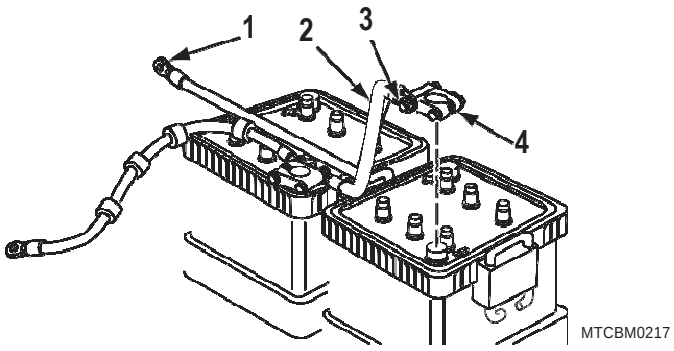


Figure 1. Battery Removal.

2. Disconnect opposite end of lead (Figure 2, Item 18) from semitrailer ground.
3. Remove fastener (Figure 2, Item 17) and lead (Figure 2, Item 14) from terminal (Figure 2, Item 15).
4. Remove fastener (Figure 2, Item 9) and lead (Figure 2, Item 5) from terminal (Figure 2, Item 10).
5. Remove fastener (Figure 2, Item 4), lead (Figure 2, Item 5), fastener (Figure 2, Item 2), and lead (Figure 2, Item 1) from terminal (Figure 2, Item 3).
6. Disconnect opposite end of lead (Figure 2, Item 1) from buss bar.
7. Disconnect opposite end of lead (Figure 2, Item 1) from starter (Figure 2, Item 20).
8. Remove fastener (Figure 2, Item 16) and lead (Figure 2, Item 19) from terminal (Figure 2, Item 15).
9. Disconnect opposite end of lead (Figure 2, Item 19) from engine ground.
10. Remove fastener (Figure 2, Item 8), lead (Figure 2, Item 6), wiring harness (Figure 2, Item 7), and wiring harness (Figure 2, Item 11) from terminal (Figure 2, Item 10).
11. Disconnect opposite end of lead (Figure 2, Item 6) from starter (Figure 2, Item 20).
12. Disconnect opposite end of wiring harness (Figure 2, Item 7) from junction box solenoid.
13. Disconnect opposite end of wiring harness (Figure 2, Item 11) from junction box circuit breaker.

END OF TASK

INSTALLATION

1. Install lead (Figure 2, Item 6), wiring harness (Figure 2, Item 7), and wiring harness (Figure 2, Item 11) on terminal (Figure 2, Item 10) with fastener (Figure 2, Item 8).
2. Connect opposite end of lead (Figure 2, Item 6) to starter (Figure 2, Item 20).
3. Connect opposite end of wiring harness (Figure 2, Item 7) to junction box solenoid.
4. Connect opposite end of wiring harness (Figure 2, Item 11) to junction box circuit breaker.
5. Install lead (Figure 2, Item 19) on terminal (Figure 2, Item 15) with fastener (Figure 2, Item 16).
6. Connect opposite end of lead (Figure 2, Item 19) to engine ground.
7. Connect lead (Figure 2, Item 1) to starter (Figure 2, Item 20).

INSTALLATION - Continued

8. Connect lead (Figure 2, Item 1) to buss bar.
9. Install opposite end of lead (Figure 2, Item 1) with fastener (Figure 2, Item 2) and lead (Figure 2, Item 5) with fastener (Figure 2, Item 4) on terminal (Figure 2, Item 3).
10. Install lead (Figure 2, Item 5) on terminal (Figure 2, Item 10) with fastener (Figure 2, Item 9).
11. Install lead (Figure 2, Item 14) on terminal (Figure 2, Item 15) with fastener (Figure 2, Item 17).
12. Install two leads (Figure 2, Items 14 and 18) on terminal (Figure 2, Item 12) with fastener (Figure 2, Item 13).
13. Connect opposite end of lead (Figure 2, Item 18) to semitrailer ground.

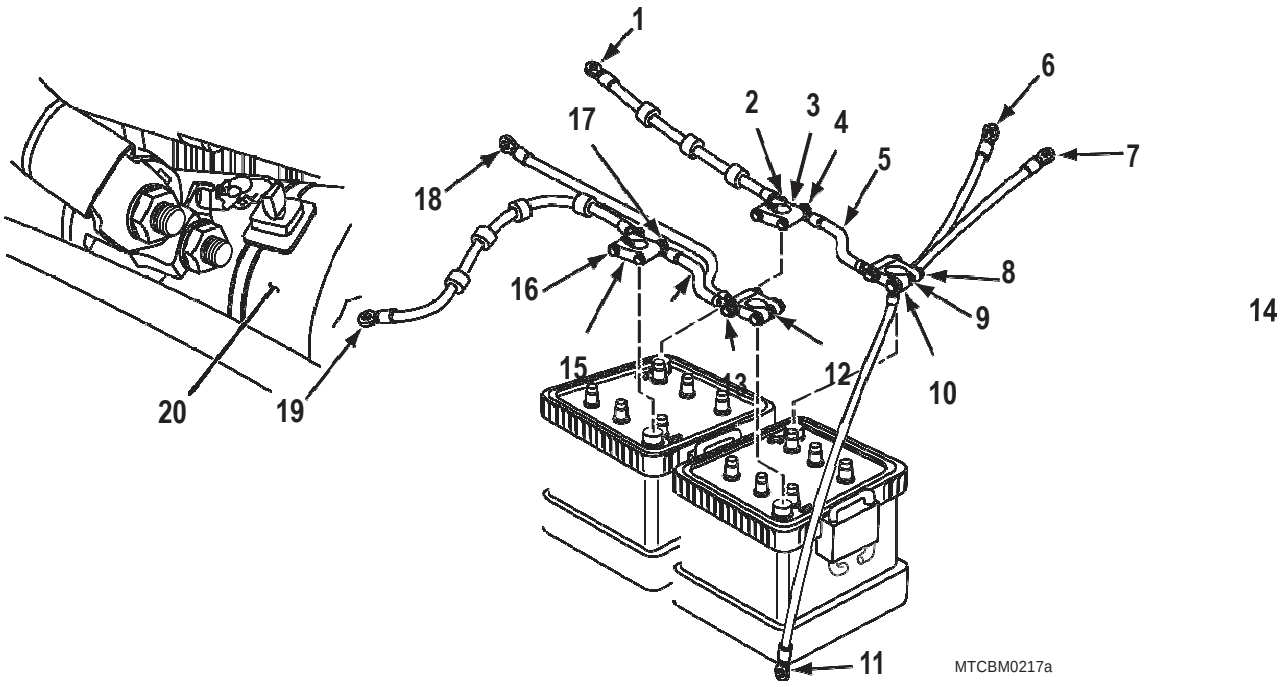


Figure 2. Battery Replacement.

END OF TASK

FOLLOW ON TASK

Install negative and positive terminals and battery cover (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FRONT BLACKOUT MARKER LIGHTS WIRING HARNESS MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 26)
Gasket (WP 0295, Table 1, Item 28)
Washer, Lock
Qty: (6) (WP 0295, Table 1, Item 192)

References
WP 0113

Equipment Condition
Roadside composite light cover plate removed (WP 0094)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

NOTE

- Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.
- Front blackout marker light boxes and access covers on curbside and roadside of semitrailer. Removal of marker light boxes and access covers are the same for both sides; roadside procedures are shown.

ACCESS COVER REMOVAL

1. Remove six screws (Figure 1, Item 2) and lockwashers (Figure 1, Item 3), access cover (Figure 1, Item 4), and gasket (Figure 1, Item 5) from semitrailer access hole (Figure 1, Item 1). Discard gasket (Figure 1, Item 5) and lockwashers (Figure 1, Item 3).

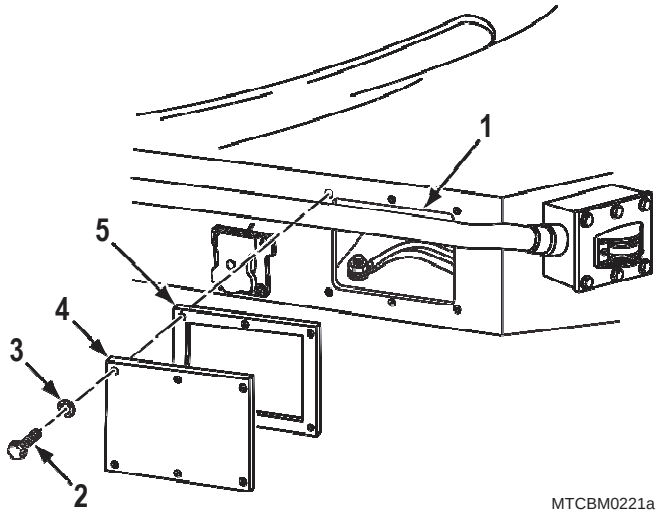


Figure 1. Access Cover Removal.

ACCESS COVER REMOVAL - Continued

2. Remove six screws (Figure 2, Item 4), cover plate (Figure 2, Item 3), and gasket (Figure 2, Item 2) from roadside blackout marker light box (Figure 2, Item 1). Discard gasket (Figure 2, Item 2).
3. Disconnect lead 490 connector (Figure 2, Item 9) of electrical intervehicular wiring harness lead assembly from lead 490 connector (Figure 2, Item 6) of front blackout marker lights wiring harness (Figure 2, Item 8).
4. Disconnect lead 490 connector (Figure 2, Item 9) of roadside blackout light (Figure 2, Item 5) from lead 490 connector (Figure 2, Item 7) of front blackout marker lights wiring harness (Figure 2, Item 8).
5. Remove connector from end of lead 490 (Figure 2, Item 7) of front blackout marker lights wiring harness.
6. Pull lead 490 (Figure 2, Item 7) of front blackout marker lights wiring harness through conduit and out of roadside blackout marker light box (Figure 2, Item 1).
7. Remove front blackout marker lights wiring harness from semitrailer.

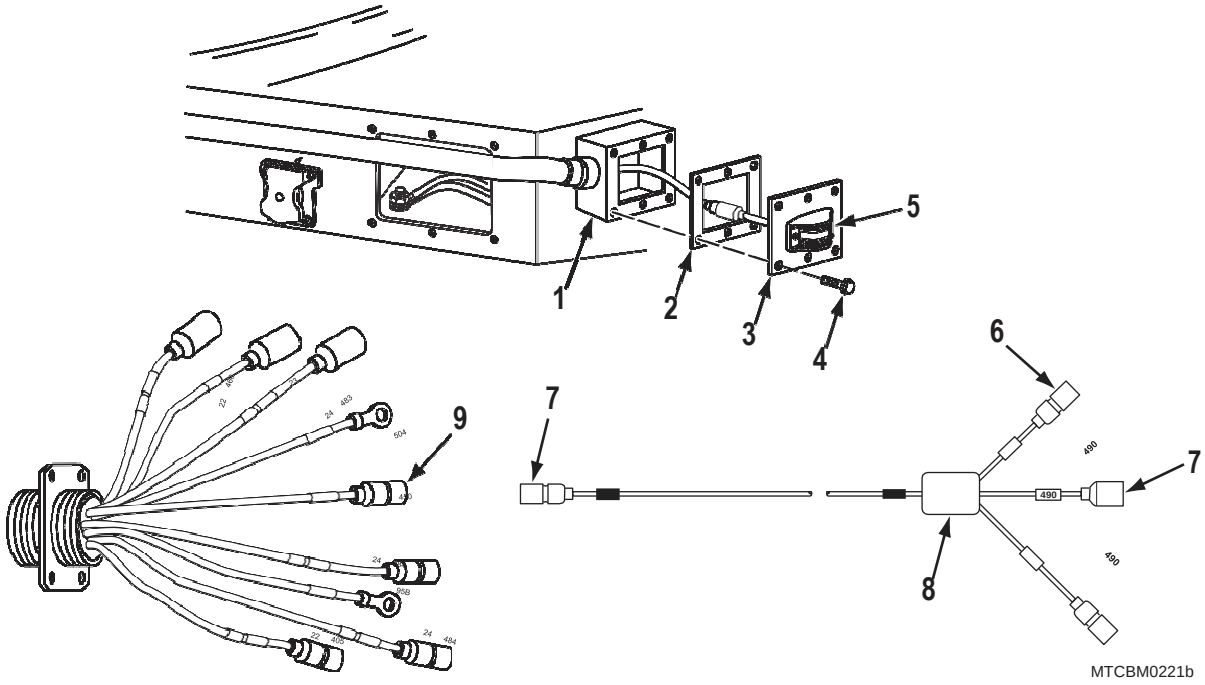


Figure 2. Marker Light Removal.

END OF TASK

INSPECTION

Inspect wiring harness for loose/damaged terminals, frayed/exposed wiring, and worn/missing insulation. If these conditions exist, perform appropriate repair to harness (WP 0113).

END OF TASK

INSTALLATION

1. Pull lead 490 (Figure 3, Item 8) of front blackout marker lights wiring harness through conduit and out of roadside composite light (Figure 3, Item 2).

INSTALLATION - Continued

2. Install connector on end of lead 490 (Figure 3, Item 8) of front blackout marker lights wiring harness.
3. Connect lead 490 connector of wiring harness 12356095 (Figure 3, Item 10) to lead 490 connector (Figure 3, Item 8) of front blackout marker lights wiring harness.
4. Connect lead 490 connector (Figure 3, Item 10) of roadside blackout light (Figure 3, Item 6) to lead 490 connector (Figure 3, Item 8) of front blackout marker lights wiring harness (Figure 3, Item 9).
5. Connect lead 490 connector (Figure 3, Item 10) of electrical intervehicular wiring harness lead assembly to lead 490 connector (Figure 3, Item 7) of front blackout marker lights wiring harness (Figure 3, Item 9).
6. Install 6 screws (Figure 3, Item 5), cover plate (Figure 3, Item 4), and new gasket (Figure 3, Item 3) on curbside and roadside blackout marker light box (Figure 3, Item 2).
7. Install six screws (Figure 3, Item 11), new lockwashers (Figure 3, Item 12), access cover (Figure 3, Item 13), and new gasket (Figure 3, Item 14) on semitrailer access hole (Figure 3, Item 1).

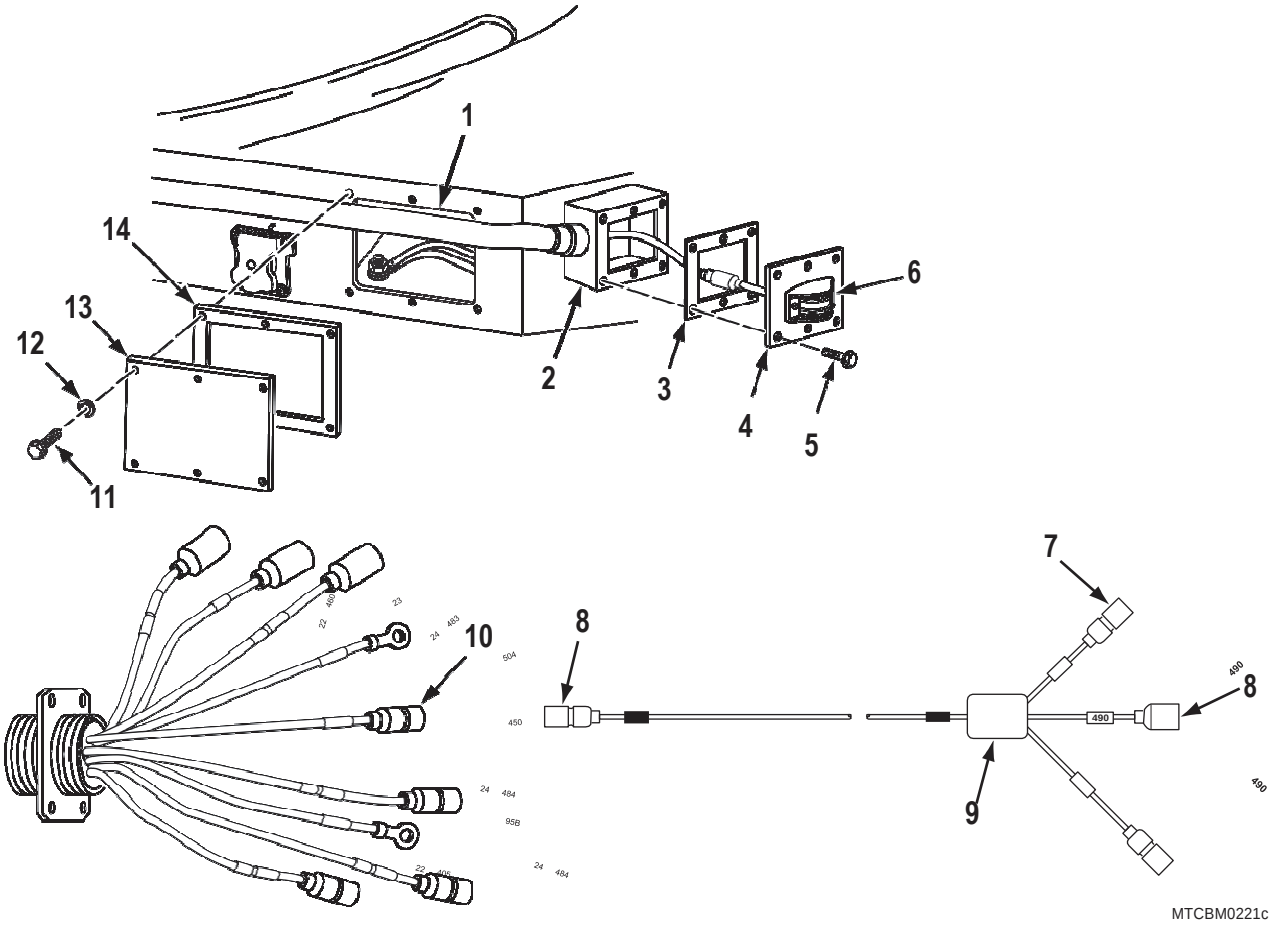


Figure 3. Marker Light Installation.

END OF TASK

FOLLOW ON TASK

1. Install roadside composite light cover plate (WP 0094).
2. Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
MAIN TRAILER WIRING HARNESS MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Tag, Marker (WP 0293, Table 1, Item 28)

References
WP 0113

Equipment Condition
Semitrailer uncoupled (WP 0007)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Roadside and curbside composite light removed (WP 0106)
Curbside marker lights removed (WP 0108)
Intervehicular connector and harness removed (WP 0110)

WARNING

When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

- Tag all leads prior to removal for ease of installation. Tags should be placed on leads since some connectors will be removed.
- Connectors must be removed, were called out, in order to pull trailer harness through conduit. Remove additional connectors as necessary.

REMOVAL

1. Disconnect trailer main wiring harness (Figure 1, Item 22), connector 21-489 (Figure 1, Item 23), from roadside front marker light harness (Figure 1, Item 26), connector 21-489 (Figure 1, Item 25) inside front access hole (Figure 1, Item 24). Remove connector 21-489 (Figure 1, Item 23) from trailer main wiring harness (Figure 1, Item 22).
2. Disconnect trailer main wiring harness (Figure 1, Item 22), connector 21-489 (Figure 1, Item 19), and connector 21-489 (Figure 1, Item 21), from roadside marker light harness (Figure 1, Item 1), connector 21-489 (Figure 1, Item 2), and connector 21-489 (Figure 1, Item 3), inside curbside marker light access hole (Figure 1, Item 20). Remove connector 21-489 (Figure 1, Item 19) and connector 21-489 (Figure 1, Item 21) from trailer main wiring harness (Figure 1, Item 22).
3. Disconnect trailer main wiring harness (Figure 1, Item 22), connector 21-489 (Figure 1, Item 18), from roadside composite light harness (Figure 1, Item 4), connector 489 (Figure 1, Item 5) inside roadside composite access hole (Figure 1, Item 6).
4. Disconnect trailer main wiring harness (Figure 1, Item 22), connector 21-489 (Figure 1, Item 16), and connector 21-489 (Figure 1, Item 17), from connector lead harness (Figure 1, Item 7), connector 489 (Figure 1, Item 8), and connector 489 (Figure 1, Item 9) inside curbside composite access hole (Figure 1, Item 10).
5. Disconnect trailer main wiring harness (Figure 1, Item 22), connector 23 (Figure 1, Item 15), and connector 23 (Figure 1, Item 14), from curbside rear composite light harness (Figure 1, Item 12), connector 23 (Figure 1, Item 11), and connector 23 (Figure 1, Item 13) inside curbside composite access hole (Figure 1, Item 10).

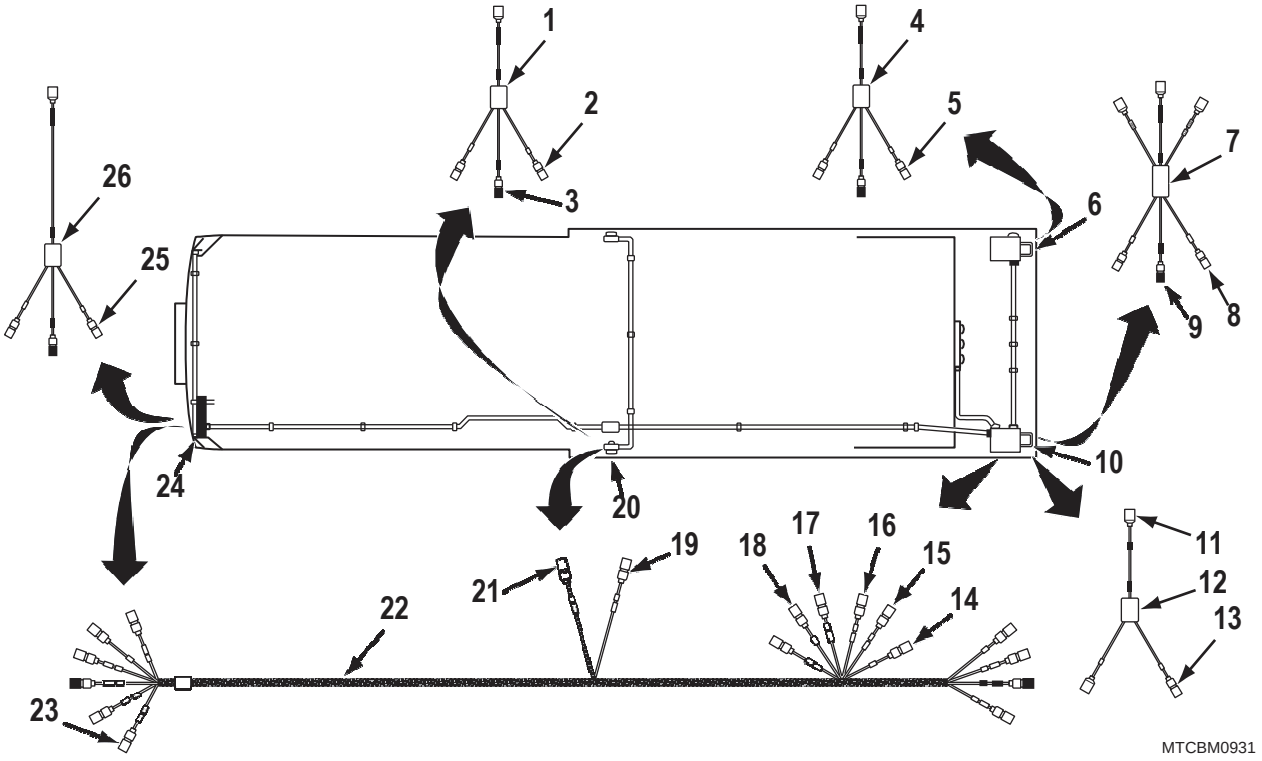


Figure 1. Trailer Main Wiring Harness Disconnection.

REMOVAL - Continued

6. Pull front half of trailer main harness from conduits (Figure 2, Item 1) out through curbside marker access hole (Figure 2, Item 4).
7. Pull roadside of trailer main harness from conduit (Figure 2, Item 2) out through curbside composite light access hole (Figure 2, Item 3).
8. Pull main harness from trailer out through curbside composite light access hole (Figure 2, Item 3).

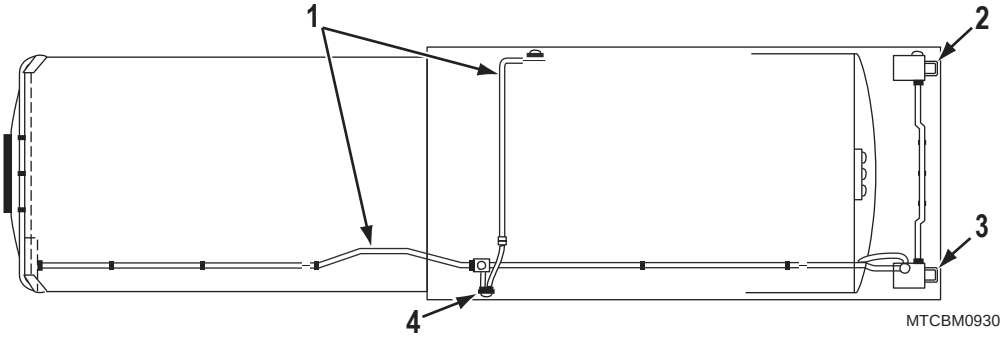


Figure 2. Trailer Main Wiring Harness Removal.

END OF TASK

INSPECTION

Inspect wiring harness for loose/damaged terminals, frayed/exposed wiring, and worn/missing insulation. If any harness is damaged, repair harness (WP 0113).

END OF TASK

INSTALLATION

1. Install main harness on trailer through curbside composite light access hole (Figure 3, Item 6).
2. Install main harness from roadside of trailer through curbside composite light access hole (Figure 3, Item 10).
3. Install connectors removed during disconnection of harness (WP 0113).
4. Install conduit main harness from front half of trailer through curbside marker access hole (Figure 3, Item 20).
5. Connect connector 23 (Figure 3, Item 13) and connector 23 (Figure 3, Item 11) through inside curbside composite access hole (Figure 3, Item 10), connector 23 (Figure 3, Item 14) and connector 23 (Figure 3, Item 15) through curbside rear composite light harness (Figure 3, Item 12) to trailer main wiring harness (Figure 3, Item 22).
6. Connect connector 489 (Figure 3, Item 9) and connector 489 (Figure 3, Item 8) through inside curbside composite access hole (Figure 3, Item 10) and connector 21-489 (Figure 3, Item 17), connector 21-489 (Figure 3, Item 16) through connector lead harness (Figure 3, Item 7) to trailer main wiring harness (Figure 3, Item 22).
7. Connect connector 489 (Figure 3, Item 5) through inside roadside composite access hole (Figure 3, Item 6) and connector 21-489 (Figure 3, Item 18) through roadside composite light harness (Figure 3, Item 4) to trailer main wiring harness (Figure 3, Item 22).
8. Install connector 21-489 (Figure 3, Item 21) and connector 489 (Figure 3, Item 19) to trailer main wiring harness (Figure 3, Item 22). Connect connector 21-489 (Figure 3, Item 3) and connector 21-489 (Figure 3, Item 2) through inside curbside marker light access hole (Figure 3, Item 20), connector 21-489 (Figure 3, Item 21) and connector 21-489 (Figure 3, Item 19) through roadside marker light harness (Figure 3, Item 1) to trailer main wiring harness (Figure 3, Item 22).
9. Install connector 21-489 (Figure 3, Item 23) to trailer main wiring harness (Figure 3, Item 22). Connect connector 21-489 (Figure 3, Item 25) through inside front access hole (Figure 3, Item 24), and connector 21-489 (Figure 3, Item 23) through roadside front marker light harness (Figure 3, Item 26) to trailer main wiring harness (Figure 3, Item 22).

INSTALLATION - Continued

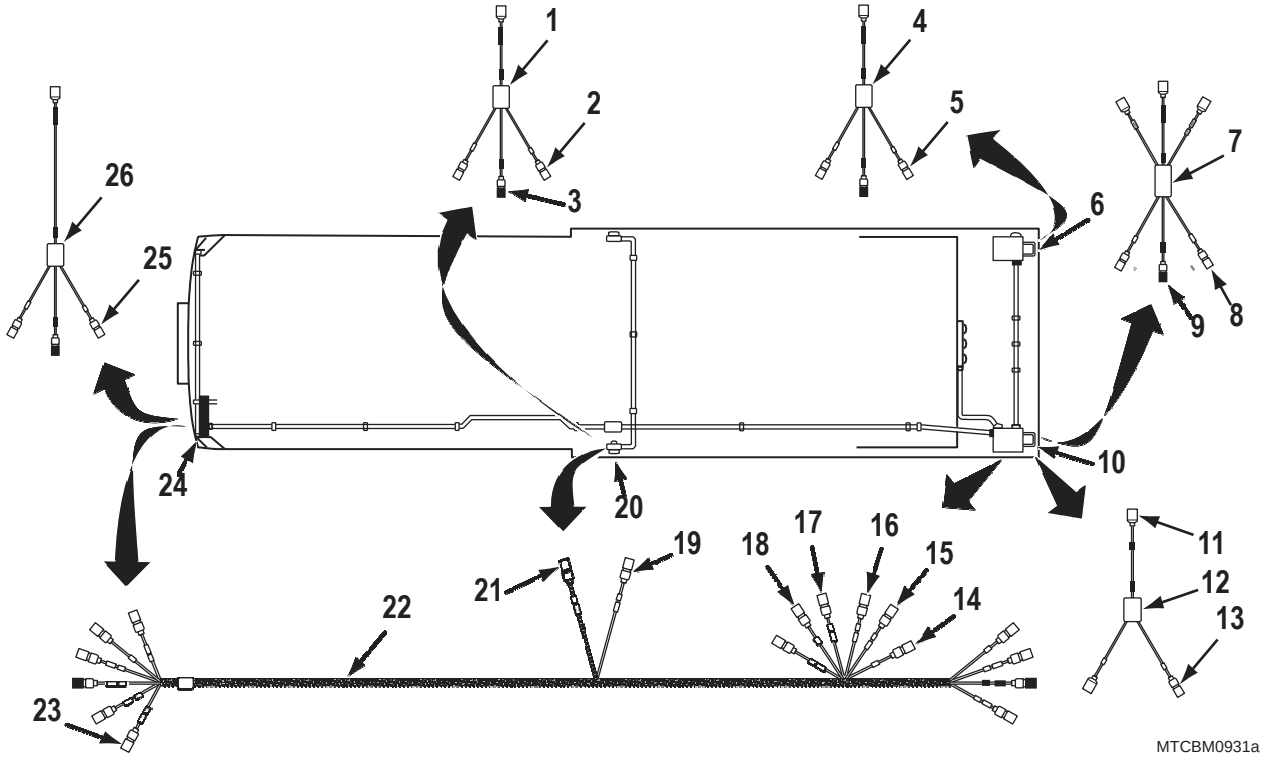


Figure 3. Trailer Main Wiring Harness Installation.

END OF TASK

FOLLOW ON TASK

1. Install intervehicular connector and harness (WP 0110).
2. Install curbside marker lights (WP 0108).
3. Install roadside and curbside composite lights (WP 0106).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE ELECTRICAL CONDUIT REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 161)

Equipment Condition
Electrical lead assembly removed (WP 0112)

Equipment Condition (cont.)
Negative battery cables disconnected (WP 0098)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

REMOVAL

WARNING

When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Loosen two conduit connectors (Figure 1, Item 2) from engine control panel (Figure 1, Item 3) and conduit mounting plate (Figure 1 Item 1).

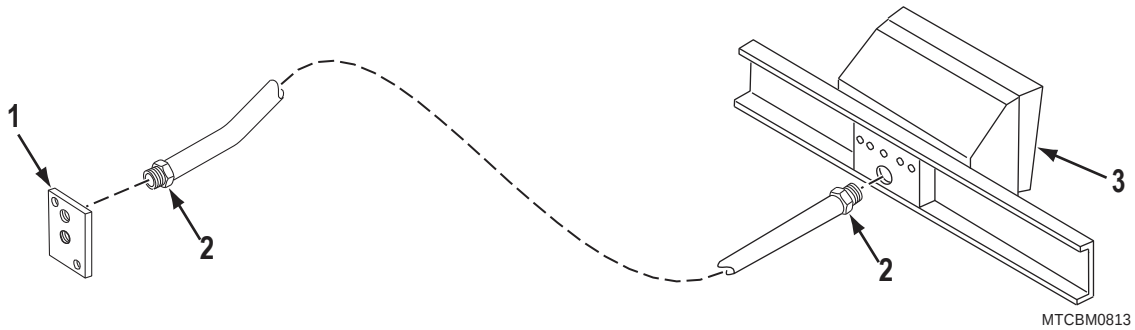


Figure 1. Engine Electrical Conduit Removal.

REMOVAL - Continued

2. Remove two capscrews (Figure 2, Item 3) and self-locking nuts (Figure 2, Item 1) from mounting plate (Figure 2, Item 2). Discard self-locking nuts (Figure 2, Item 1).
3. Remove mounting plate (Figure 2, Item 2) and engine electrical conduit (Figure 2, Item 6) from engine control panel (Figure 2, Item 4).
4. Remove two conduit connectors (Figure 2, Item 5) from conduit (Figure 2, Item 6).

END OF TASK

INSTALLATION

1. Install two conduit connectors (Figure 2, Item 5) on conduit (Figure 2, Item 6).
2. Install conduit (Figure 2, Item 6) on control panel (Figure 2, Item 4) and mounting plate (Figure 2, Item 2).
3. Install two capscrews (Figure 2, Item 3) and new self-locking nuts (Figure 2, Item 1) on mounting plate (Figure 2, Item 2).
4. Tighten two conduit connectors (Figure 2, Item 5).

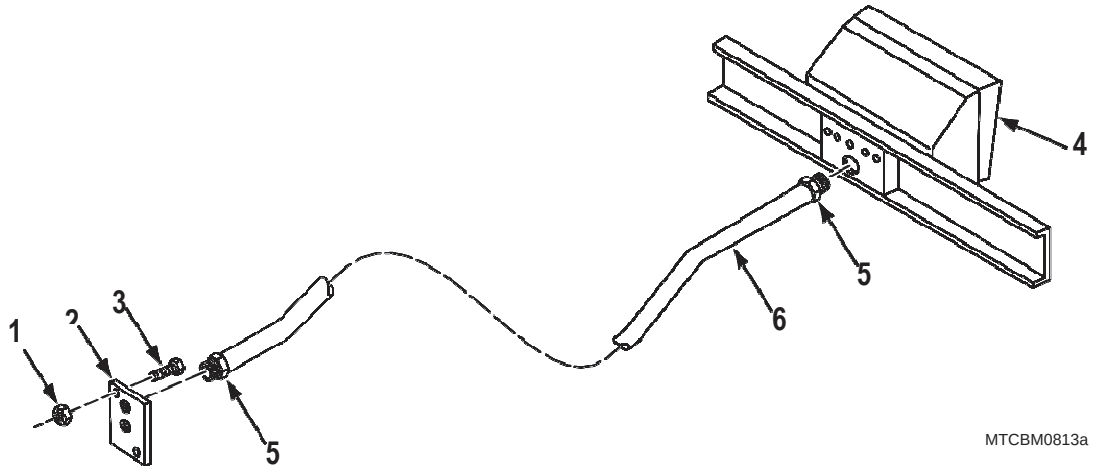


Figure 2. Engine Electrical Conduit Replacement.

END OF TASK

FOLLOW ON TASK

1. Install electrical lead assembly (12267081) (WP 0112).
2. Connect negative battery cable (WP 0098).
3. Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE ELECTRICAL WIRING REPAIR

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Crimping Tool, Terminal
(WP 0294, Table 1, Item 2)

Materials/Parts
Tape, Insulation, Electrical

Materials/Parts (cont.)
(WP 0293, Table 1, Item 30)

Equipment Condition
Negative battery cables disconnected (WP 0098)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

REPAIR

1. Check ends of wire harness and leads for frayed insulation and broken wires. Tape or replace frayed wires.
2. Inspect wires for bent, broken, or missing terminals. Replace missing or damaged terminals.

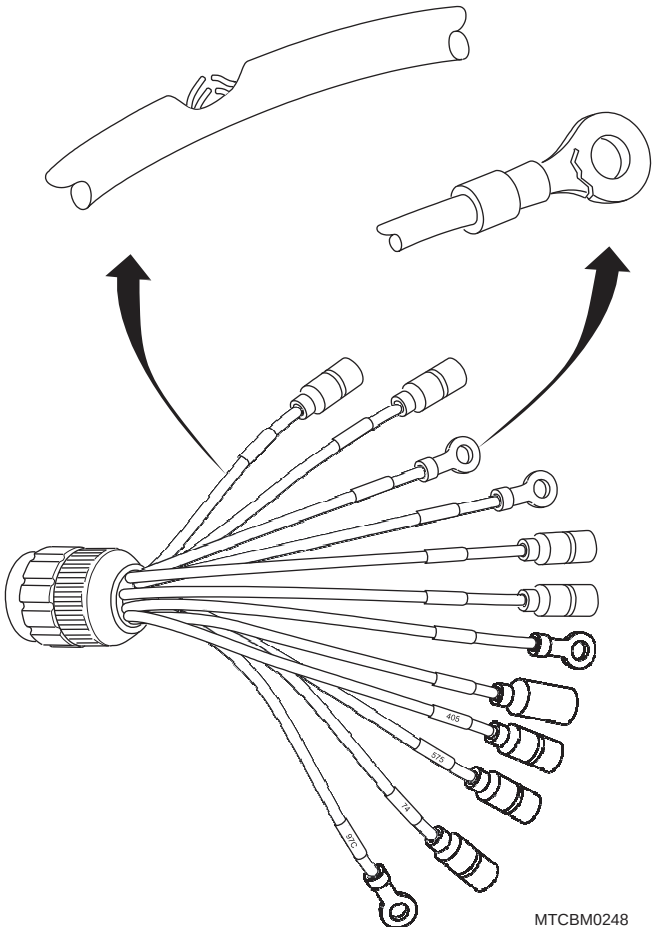


Figure 1. Wire Harness Repair.

END OF TASK

FOLLOW ON TASK

1. Connect negative battery cables (WP 0098).
2. Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
SERVICE LIGHT HARNESS MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Connector (WP 0295, Table 1, Item 116)
Gasket Qty: (2) (WP 0295, Table 1, Item 25)

References
WP 0113

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

NOTE

- Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.
- Service light boxes are located on curbside and roadside of semitrailer; roadside service light box is shown.
- Removal of cover plate is the same for both service light boxes. Roadside service light is shown.

REMOVAL

1. Remove four screws (Figure 1, Item 4), two cover plates (Figure 1, Item 3), and two gaskets (Figure 1, Item 2) from roadside and curbside service light boxes (Figure 1, Item 1). Discard gaskets (Figure 1, Item 2).

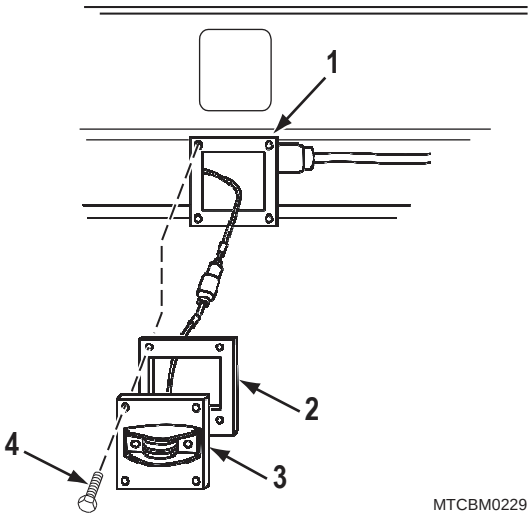


Figure 1. Service Light Box Removal.

REMOVAL - Continued

2. At roadside service light box, disconnect lead 21-489 connectors (Figure 2, Items 1 and 2) of main trailer wiring harness (Figure 2, Item 3) from lead 489 connectors (Figure 3, Items 5 and 7) of lead assembly (Figure 3, Item 4).
3. Disconnect leads 489 connector (Figure 3, Item 6) of lead assembly (Figure 3, Item 4) from lead 489 connector (Figure 3, Item 8) of roadside service light (Figure 3, Item 11).
4. Disconnect lead 489 connector (Figure 3, Item 3) of lead assembly (Figure 3, Item 4) from lead 489 connector (Figure 3, Item 8) of curbside service light (Figure 3, Item 11). Cut connector (Figure 3, Item 3) from end of lead assembly (Figure 3, Item 4).
5. Pull lead assembly (Figure 3, Item 4) through conduit (Figure 3, Item 2) and out through roadside service light box (Figure 3, Item 1).

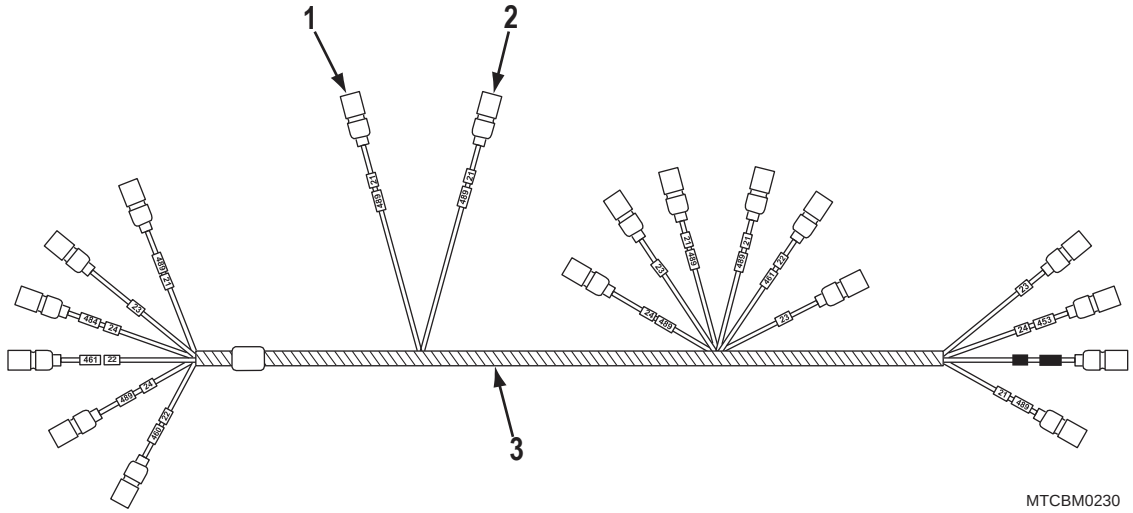


Figure 2. Lead Assembly Removal.

END OF TASK

INSTALLATION

NOTE

Repair wiring harness as required (WP 0113).

1. Pull lead assembly (Figure 3, Item 4) through conduit (Figure 3, Item 2) and out through curbside light box (Figure 3, Item 1).
2. Install new connector on lead assembly (Figure 3, Item 4).
3. Connect lead 489 connector (Figure 3, Item 3) of lead assembly (Figure 3, Item 4) to lead 489 connector (Figure 3, Item 8) of curbside service light (Figure 3, Item 11).
4. Connect lead 489 connector (Figure 3, Item 6) of lead assembly (Figure 3, Item 4) to lead 489 connector (Figure 3, Item 8) of roadside service light (Figure 3, Item 11).
5. At roadside service light box (Figure 3, Item 1), connect lead 21-489 connectors (Figure 2, Items 1 and 2) of main trailer wiring harness (Figure 2, Item 3) to lead 489 connectors (Figure 3, Items 5 and 7) of lead assembly (Figure 3, Item 4).

INSTALLATION - Continued

6. Install two new gaskets (Figure 3, Item 9), cover plates (Figure 3, Item 10), and four screws (Figure 3, Item 12) to roadside and curbside service light boxes (Figure 3, Item 1).

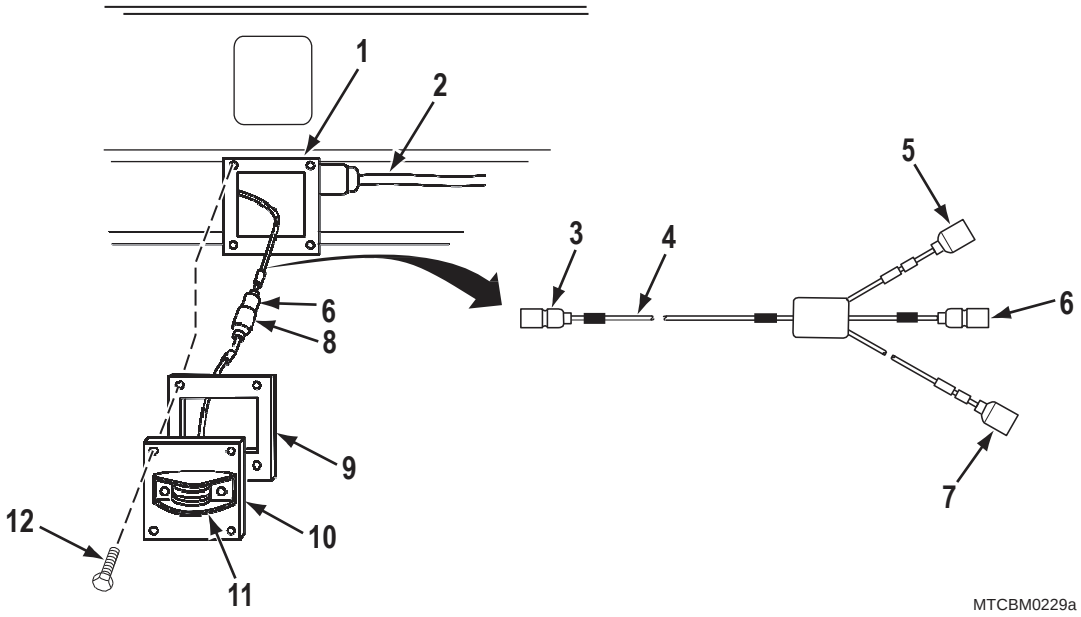


Figure 3. Service Light Box Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BLACKOUT MARKER HARNESS MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Connector (WP 0295, Table 1, Item 116)
Gasket (WP 0295, Table 1, Item 29)
Gasket (WP 0295, Table 1, Item 28)
Washer, Lock

Materials/Parts (cont.)
Qty: (6) (WP 0295, Table 1, Item 192)

References
WP 0113

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

NOTE

- Front blackout marker light boxes are located on curbside and roadside of semitrailer. Removal of cover plate is the same for both boxes.
- Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Remove six screws (Figure 1, Item 8), lockwashers (Figure 1, Item 9), access cover (Figure 1, Item 6), and gasket (Figure 1, Item 7) from access hole (Figure 1, Item 1). Discard gasket (Figure 1, Item 7) and lockwashers (Figure 1, Item 9).
2. Remove six screws (Figure 1, Item 5), two cover plates (Figure 1, Item 4), and gaskets (Figure 1, Item 3) from curbside and roadside front blackout marker light boxes (Figure 1, Item 2). Discard gaskets (Figure 1, Item 3).

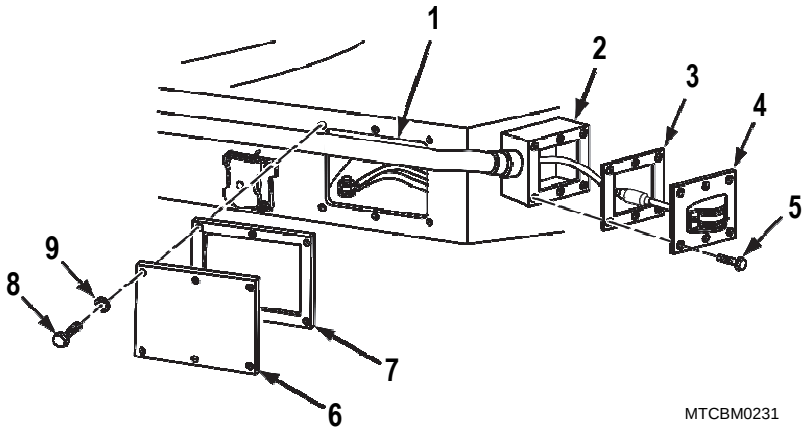


Figure 1. Access Cover Removal.

REMOVAL - Continued

3. Disconnect lead 489 (Figure 2, Item 4) connector of front marker lights lead assembly from service light lead 489 connector (Figure 2, Item 5) at curbside blackout marker light box (Figure 2, Item 3).

NOTE

Connector must be removed to pull lead through conduit.

4. Cut connector from end of front marker lights lead assembly (Figure 3, Item 2).
5. Disconnect leads 21-489 connector (Figure 3, Item 4) of front marker lights lead assembly (Figure 3, Item 2) from lead 21-489 connector (Figure 3, Item 11) of main trailer wiring harness (Figure 3, Item 10) inside access hole (Figure 2, Item 1).
6. Disconnect lead 489 connector (Figure 3, Item 5) of front marker lights lead assembly (Figure 3, Item 2) from lead 489 connector (Figure 3, Item 9) of electrical jumper from intervehicular cable to roadside blackout marker light lead (Figure 3, Item 8) inside access hole (Figure 2, Item 1).
7. Disconnect lead 489 connector (Figure 3, Item 1) of front marker lights lead assembly (Figure 3, Item 2) from lead 21-489 connector (Figure 3, Item 6) of electrical intervehicular wiring harness lead assembly (Figure 3, Item 7). Pull lead 489 (Figure 3, Item 3) of front marker lights lead assembly (Figure 3, Item 2) through conduit (Figure 2, Item 2) and remove front marker lights lead assembly (Figure 3, Item 2) from roadside blackout marker light box (Figure 2, Item 3).

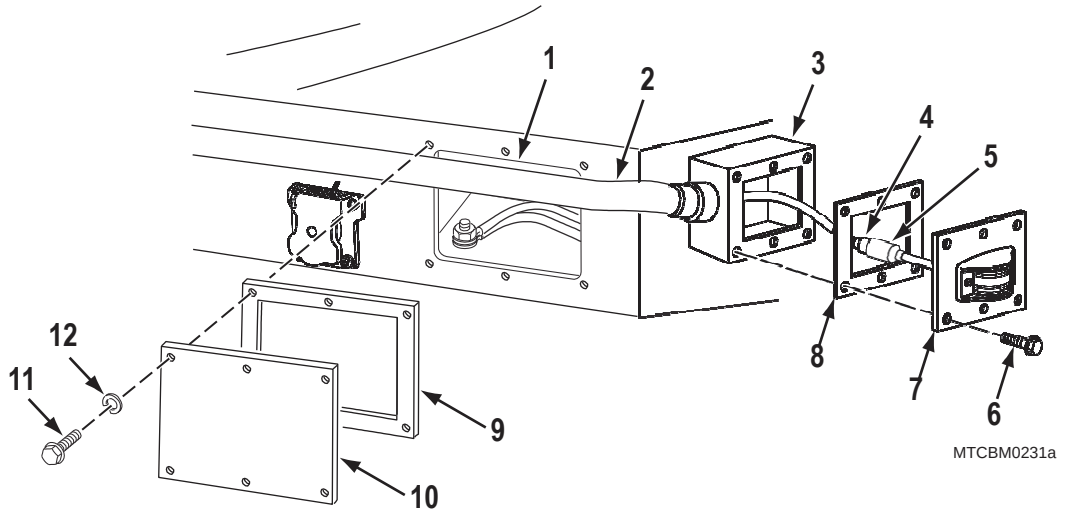


Figure 2. Marker Light Box Replacement.

END OF TASK

INSTALLATION

NOTE

Repair front marker lights lead assembly as required (WP 0113).

1. Pull lead 489 (Figure 2, Item 5) through conduit (Figure 2, Item 2) and out through curbside light box (Figure 2, Item 3). Disconnect lacing wire from lead 489 (Figure 2, Item 5).
2. Install new connector on lead 489 (Figure 2, Item 5).

INSTALLATION - Continued

3. Connect lead 489 connector (Figure 3, Item 1) of front marker lights lead assembly (Figure 3, Item 2) to lead 21-489 connector (Figure 3, Item 6) of electrical intervehicular wiring harness lead assembly (Figure 3, Item 7).
4. Connect lead 489 connector (Figure 3, Item 5) of front marker lights lead assembly (Figure 3, Item 2) to lead 489 connector (Figure 3, Item 9) of electrical jumper from intervehicular cable to roadside blackout marker lights lead (Figure 3, Item 8) inside access hole (Figure 2, Item 1).
5. Connect lead 21-489 connector (Figure 3, Item 4) of front marker lights lead assembly (Figure 3, Item 2) to lead 21-489 connector (Figure 3, Item 11) of main trailer wiring harness (Figure 3, Item 10) inside access hole (Figure 2, Item 1).
6. Connect lead 489 connector (Figure 2, Item 4) of front marker lights lead assembly (Figure 3, Item 2) from service light lead 489 connector (Figure 2, Item 5) at curbside blackout marker light box (Figure 2, Item 3).
7. Install two new gaskets (Figure 2, Item 8), cover plates (Figure 2, Item 7), and six screws (Figure 2, Item 6) on roadside and curbside front blackout marker light boxes (Figure 2, Item 3).
8. Install new gasket (Figure 2, Item 9) and access cover plate (Figure 2, Item 10) on access hole (Figure 2, Item 1) with six new lockwashers (Figure 2, Item 12) and screws (Figure 2, Item 11).

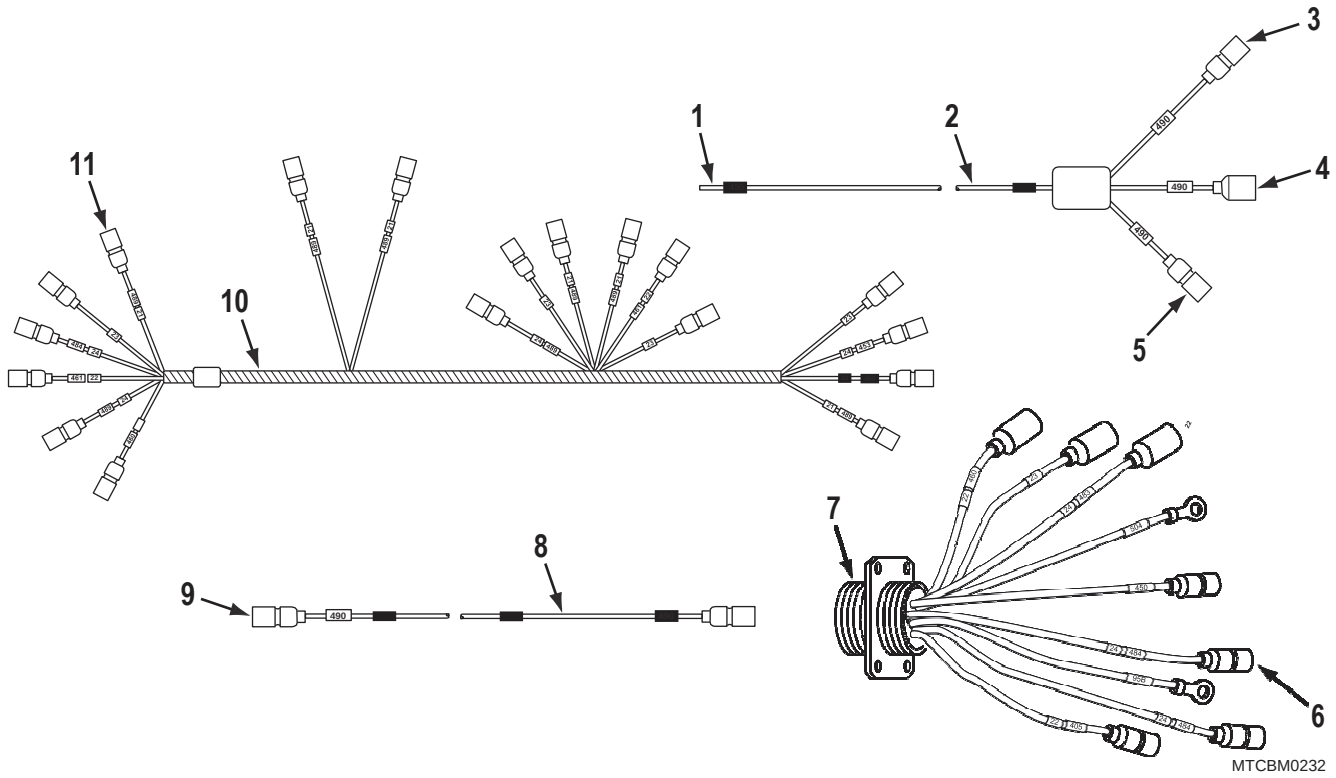


Figure 3. Lead Assembly Replacement.

END OF TASK

FOLLOW ON TASK

Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
REAR BLACKOUT MARKER LIGHT WIRING HARNESS MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0094
WP 0113

Equipment Condition
Curbside composite light cover plate removed
(WP 0094)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Disconnect lead 489 connector (Figure 1, Item 3) of lead assembly (Figure 1, Item 4) from service light lead 489 connector (Figure 1, Item 2) at curbside blackout marker light box (Figure 1, Item 1).

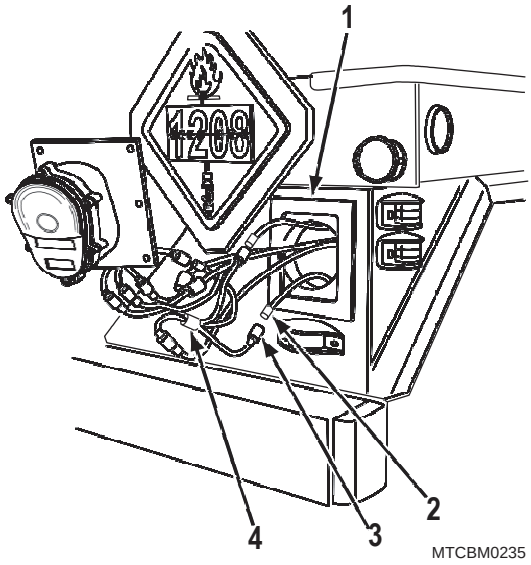


Figure 1. Service Light Leads Removal.

REMOVAL - Continued

2. Disconnect lead 489 connector (Figure 2, Item 3) of lead assembly (Figure 2, Item 6) from service light lead 489 connector (Figure 2, Item 2) at curbside blackout marker light box (Figure 2, Item 1).
3. Disconnect lead 489 connector (Figure 2, Item 9) of lead assembly (Figure 2, Item 6) from lead 21 connector (Figure 2, Item 10) of curbside composite light.
4. Disconnect lead 489 connector (Figure 2, Item 7) of lead assembly (Figure 2, Item 6) from lead 21-489 connector (Figure 2, Item 8) at main trailer wiring harness. Remove lead assembly (Figure 2, Item 6) from curbside blackout marker box (Figure 2, Item 1).

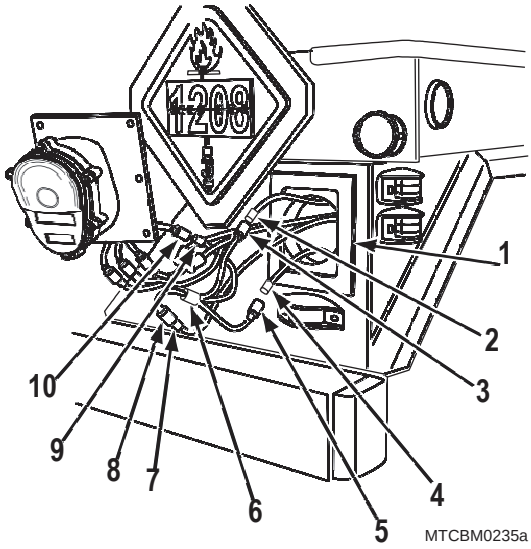


Figure 2. Service Light Leads Removal.

END OF TASK

INSTALLATION

NOTE

Repair wiring harness as required (WP 0113).

1. Connect lead 489 connector (Figure 2, Item 7) of lead assembly (Figure 2, Item 6) to lead 21-489 connector (Figure 2, Item 8) of main trailer wiring harness at curbside blackout marker box (Figure 2, Item 1).
2. Connect lead 489 connector (Figure 2, Item 9) of lead assembly (Figure 2, Item 6) to lead 21 connector (Figure 2, Item 10) of curbside composite light.
3. Connect lead 489 connector (Figure 2, Item 3) of lead assembly (Figure 2, Item 6) to service light lead 489 connector (Figure 2, Item 2) at curbside blackout marker box (Figure 2, Item 1).
4. Connect lead 489 connector (Figure 2, Item 5) of lead assembly (Figure 2, Item 6) to service light lead 489 connector (Figure 2, Item 4) at curbside blackout marker box (Figure 2, Item 1).

END OF TASK

FOLLOW ON TASK

1. Install curbside composite light cover plate (WP 0094).
2. Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
COMPOSITE LIGHT HARNESS MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0113

Equipment Condition
Roadside composite light cover plate removed
(WP 0094)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Tag and disconnect lead 489 connector (Figure 1, Item 2) of lead assembly (Figure 1, Item 1) from service light lead 489 connector (Figure 1, Item 2) at roadside composite light box (Figure 1, Item 3).

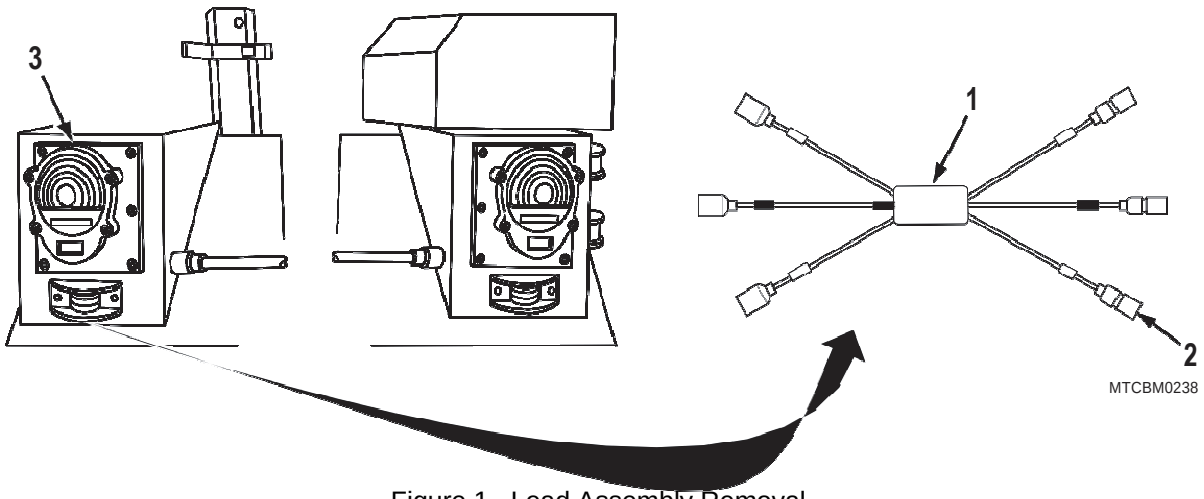


Figure 1. Lead Assembly Removal.

REMOVAL - Continued

2. Tag and disconnect lead 489 connector (Figure 2, Item 5) of lead assembly (Figure 2, Item 3) from service light lead 489 connector (Figure 2, Item 5) at roadside composite light box (Figure 2, Item 13).
3. Tag and disconnect lead 21 connector (Figure 2, Item 4) of lead assembly (Figure 2, Item 3) from composite light lead 21 connector (Figure 2, Item 4) at roadside composite light box (Figure 2, Item 13).
4. Tag and disconnect lead 21-489 connector (Figure 2, Item 10) of lead assembly (Figure 2, Item 3) from lead 21-489 connector (Figure 2, Item 9) of main trailer wiring harness (Figure 2, Item 7).
5. Tag and disconnect lead 21-489 connector (Figure 2, Item 11) of lead assembly (Figure 2, Item 3) from lead 21-489 connector (Figure 2, Item 8) of main trailer wiring harness (Figure 2, Item 7).
6. Tag and disconnect lead 489 connector (Figure 2, Item 12) of lead assembly (Figure 2, Item 3) from lead 489 connector (Figure 2, Item 1) of lead assembly (Figure 2, Item 2). Remove lead assembly (Figure 2, Item 3) from roadside composite light box (Figure 2, Item 13).

END OF TASK

INSPECTION

Inspect lead assembly for loose or damaged connectors, frayed or exposed wiring and worn or missing insulation. If these conditions exist, perform appropriate repair to harness (WP 0113).

END OF TASK

INSTALLATION

1. Connect lead 489 connector (Figure 2, Item 12) of lead assembly (Figure 2, Item 3) to lead 489 connector (Figure 2, Item 1) of lead assembly (Figure 2, Item 2).
2. Connect lead 21-489 connector (Figure 2, Item 11) of lead assembly (Figure 2, Item 3) to lead 21-489 connector (Figure 2, Item 8) of main trailer wiring harness (Figure 2, Item 7).
3. Connect lead 21-489 connector (Figure 2, Item 10) of lead assembly (Figure 2, Item 3) to lead 21-489 connector (Figure 2, Item 9) of main trailer wiring harness (Figure 2, Item 7).
4. Connect lead 21 connector (Figure 2, Item 4) of lead assembly (Figure 2, Item 3) to composite light lead 21 connector (Figure 2, Item 4) at roadside composite light box (Figure 2, Item 13).
5. Connect lead 489 connector (Figure 2, Item 5) of lead assembly (Figure 2, Item 3) to service light lead 489 connector (Figure 2, Item 5) at roadside composite light box (Figure 2, Item 13).
6. Connect lead 489 connector (Figure 2, Item 6) of lead assembly (Figure 2, Item 3) to service light lead 489 connector (Figure 2, Item 6) at roadside composite light box (Figure 2, Item 13).

INSTALLATION - Continued

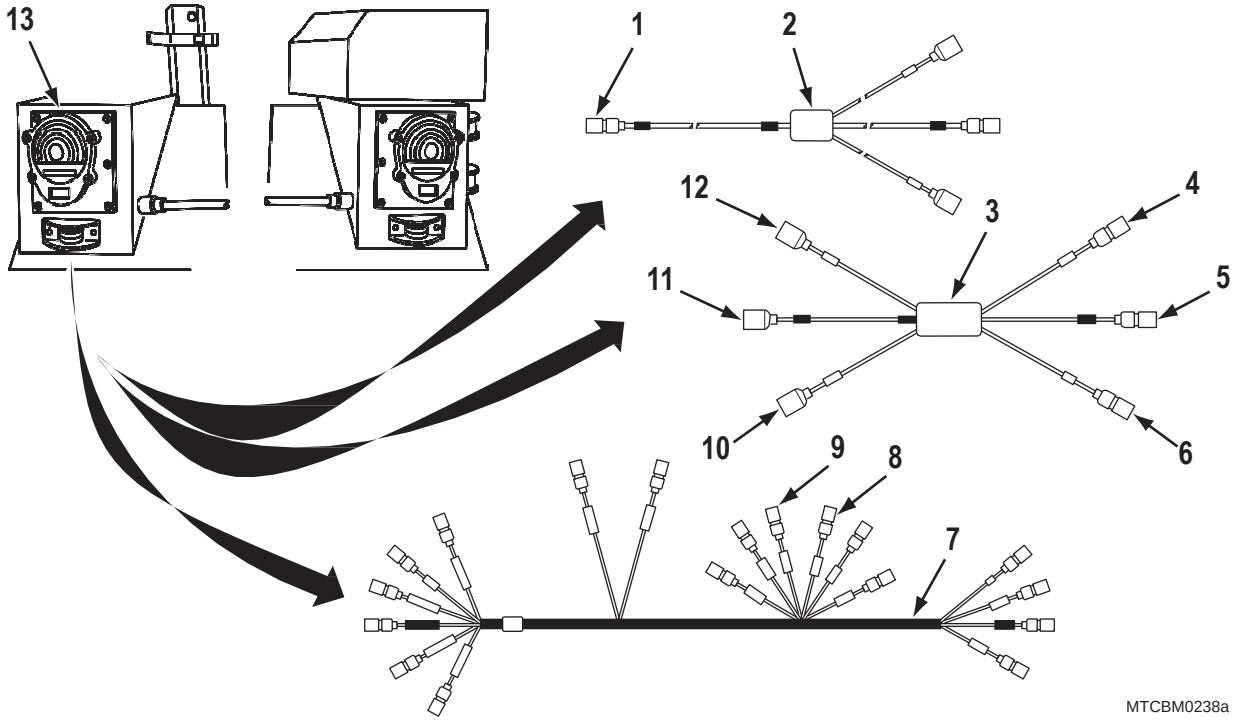


Figure 2. Lead Assembly Maintenance.

END OF TASK

FOLLOW ON TASK

1. Install roadside composite light cover plate (WP 0094).
2. Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
MARKER LIGHT HARNESS MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0113

Equipment Condition
Roadside composite light cover plate removed
(WP 0094)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

REMOVAL

NOTE

All marker lights are removed the same way.

1. Remove six screws (Figure 1, Item 3) and three lens housing covers (Figure 1, Item 2) from three marker light bodies (Figure 1, Item 1).

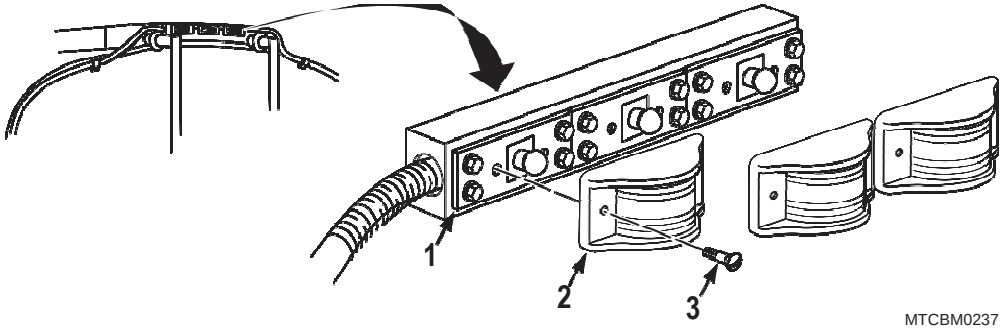


Figure 1. Lead Assembly Removal.

REMOVAL - Continued

2. Remove 12 screws (Figure 2, Item 13), washers (Figure 2, Item 14), and three marker light bodies (Figure 2, Item 15) from marker light box (Figure 2, Item 1).
3. Tag and disconnect three lead 489 connectors (Figure 2, Items 2, 4, and 7) of lead assembly (Figure 2, Item 8) from three lead connectors (Figure 2, Items 3, 5, and 16) of marker light bodies (Figure 2, Item 15).
4. Tag and disconnect lead 489 (Figure 2, Item 9) connector of lead assembly (Figure 2, Item 8) from lead connector (Figure 2, Item 11) of lead assembly (Figure 2, Item 10) at roadside composite light box. Cut connector from end of lead 489 (Figure 2, Item 17) of lead assembly (Figure 2, Item 8).
5. Pull lead assembly (Figure 2, Item 8) through conduit (Figure 2, Item 17) and out through marker light box (Figure 2, Item 1).

END OF TASK

INSTALLATION

NOTE

- All marker lights are installed the same way.
- Repair wiring harness as required (WP 0113).

1. Starting at marker light box (Figure 2, Item 1), pull lead assembly (Figure 2, Item 8) through conduit (Figure 2, Item 17) and through roadside composite light box.
2. Install new connector on lead 489 (Figure 2, Item 9) of lead assembly (Figure 2, Item 8).
3. Connect lead 489 (Figure 2, Item 9) connector of lead assembly (Figure 2, Item 8) to lead connector (Figure 2, Item 11) of lead assembly (Figure 2, Item 10) at roadside composite light box.
4. Connect three lead 489 connectors (Figure 2, Items 2, 4, and 7) of lead assembly (Figure 2, Item 8) to three lead connectors (Figure 2, Items 3, 5, and 16) of marker light bodies (Figure 2, Item 15).
5. Install 12 screws (Figure 2, Item 13), washers (Figure 2, Item 14), and three marker light bodies (Figure 2, Item 15) on marker light box (Figure 2, Item 1).
6. Install six screws (Figure 2, Item 12) and three lens housing covers (Figure 2, Item 6) on marker light bodies (Figure 2, Item 15).

INSTALLATION - Continued

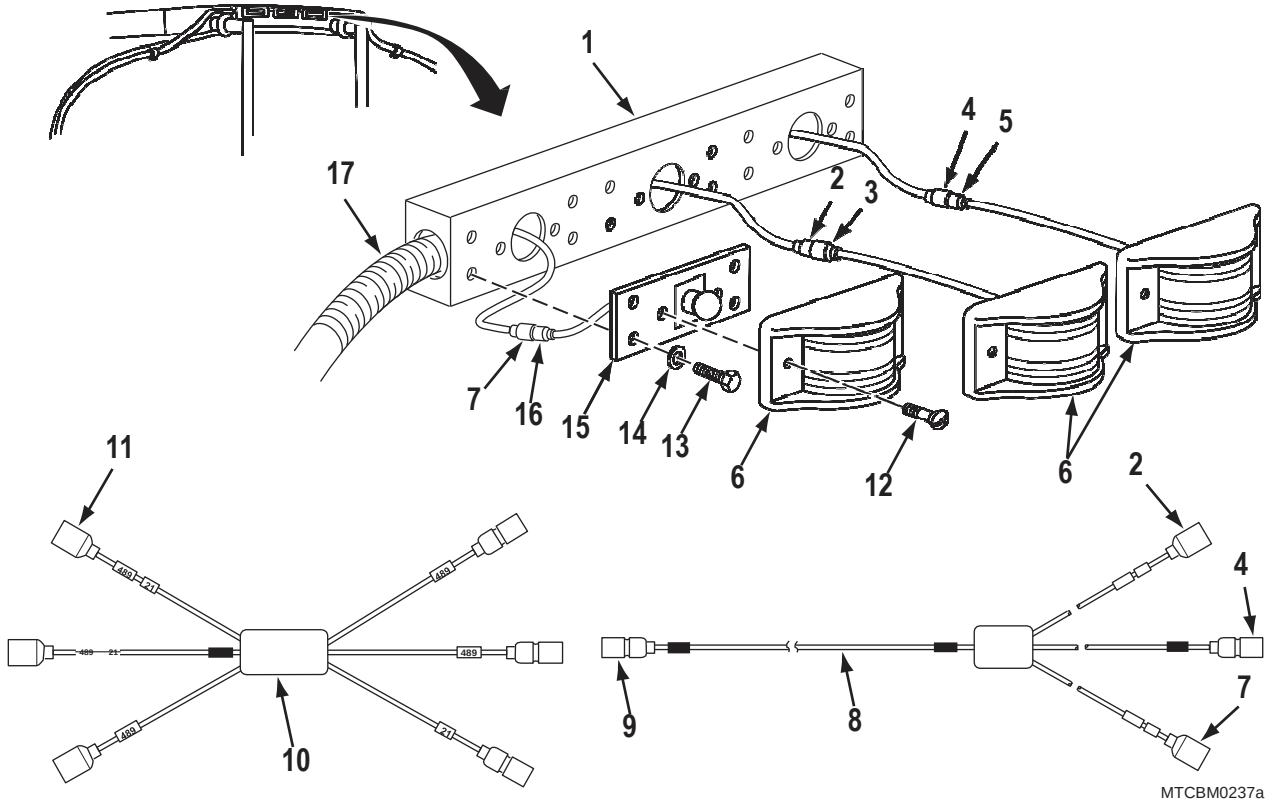


Figure 2. Lead Assembly Installation.

END OF TASK

FOLLOW ON TASK

1. Install roadside composite light cover plate (WP 0094).
2. Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ELECTRICAL LEAD MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

Materials/Parts
Gasket (WP 0295, Table 1, Item 28)

NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Remove six screws (Figure 1, Item 7), roadside blackout service marker light (Figure 1, Item 8), and gasket (Figure 1, Item 9) from roadside blackout service marker light. Discard gasket (Figure 1, Item 9).
2. Disconnect lead 489 connector (Figure 1, Item 5) of electrical jumper from intervehicular cable to roadside blackout service marker light lead (Figure 1, Item 4) from lead connector (Figure 1, Item 6) of blackout service marker light (Figure 1, Item 8) at roadside composite light box.
3. Disconnect lead 489 connector (Figure 1, Item 3) of lead (Figure 1, Item 4) from lead 489 connector (Figure 1, Item 2) of front marker lights lead assembly (Figure 1, Item 1) at roadside blackout service marker light (Figure 1, Item 8).

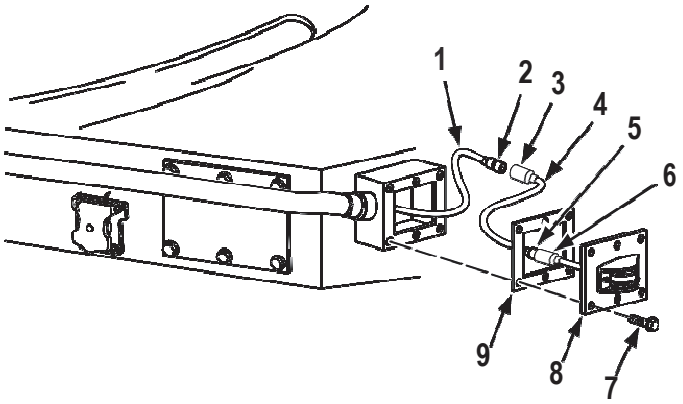


Figure 1. Blackout Service Marker Removal.

END OF TASK

INSTALLATION

1. At roadside blackout service marker light, connect lead 489 connector (Figure 2, Item 3) of lead (Figure 2, Item 4) to lead 489 connector (Figure 2, Item 2) of front marker lights lead assembly (Figure 2, Item 1).
2. At roadside blackout service marker light. connect lead 489 connector (Figure 2, Item 5) of lead (Figure 2, Item 4) to lead connector (Figure 2, Item 6) of marker light (Figure 2, Item 8).
3. Install six screws (Figure 2, Item 7), roadside blackout service marker light (Figure 2, Item 8), and new gasket (Figure 2, Item 9) at roadside blackout service marker light (Figure 1, Item 8).

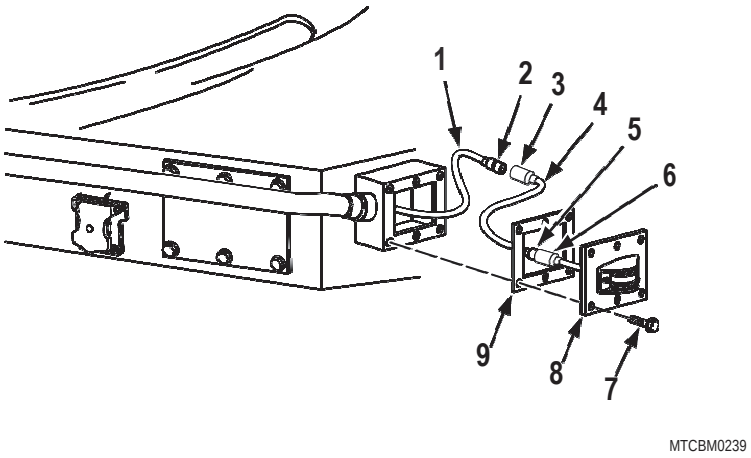


Figure 2. Blackout Service Marker Installation.

END OF TASK

FOLLOW ON TASK

Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CURBSIDE REAR COMPOSITE LIGHT LEAD ASSEMBLY

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0113

Equipment Condition
Roadside composite light cover plate removed
(WP 0094)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Disconnect lead 23 connector (Figure 1, Item 3) of lead assembly (Figure 1, Item 4) from lead 23 connector (Figure 1, Item 1) of main trailer wiring harness (Figure 1, Item 5).
2. Disconnect lead 23 connector (Figure 1, Item 6) of lead assembly (Figure 1, Item 4) from lead 23 connector (Figure 1, Item 2) of main trailer wiring harness (Figure 1, Item 5).

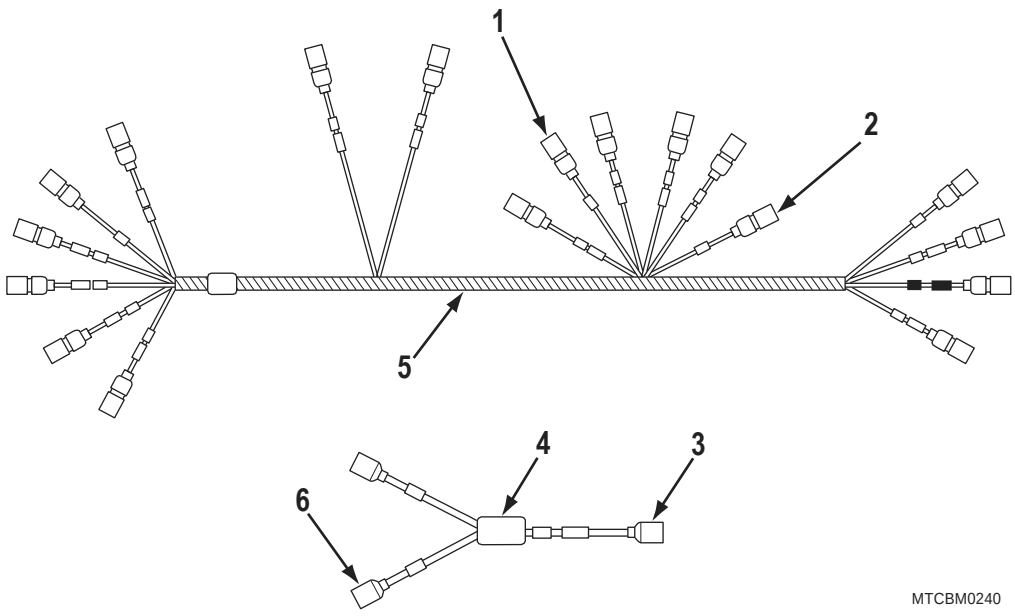


Figure 1. Lead Assembly Removal.

REMOVAL - Continued

3. Disconnect lead 23 connector (Figure 2, Item 6) of lead assembly (Figure 2, Item 5) from lead 23 connector (Figure 2, Item 1) of roadside composite light (Figure 2, Item 8). Remove lead assembly (Figure 2, Item 5) from semitrailer.

END OF TASK

INSTALLATION

NOTE

Repair wiring harness as required (WP 0113).

1. Connect lead 23 connector (Figure 2, Item 6) of lead assembly (Figure 2, Item 5) to lead 23 connector of roadside composite light (Figure 2, Item 8).
2. Connect lead 23 connector (Figure 2, Item 7) of lead assembly (Figure 2, Item 5) to lead 23 connector (Figure 2, Item 2) of main trailer wiring harness (Figure 2, Item 3).
3. Connect lead 23 connector (Figure 2, Item 4) of lead assembly (Figure 2, Item 5) to lead 23 connector (Figure 2, Item 1) of main trailer wiring harness (Figure 2, Item 3).

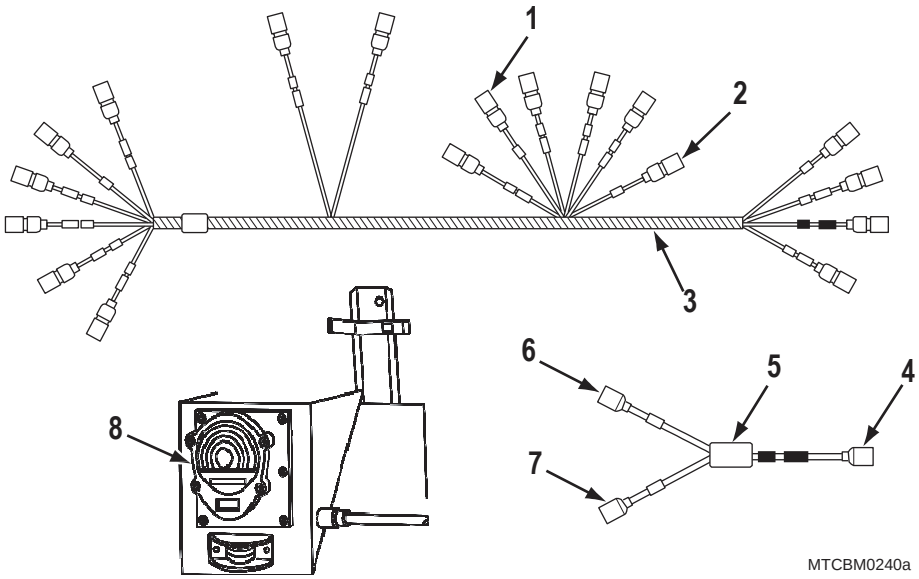


Figure 2. Lead Assembly Installation.

END OF TASK

FOLLOW ON TASK

1. Install roadside composite light cover plate (WP 0094).
2. Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
INTERVEHICULAR RECEPTACLE ASSEMBLY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 28)
Gasket (WP 0295, Table 1, Item 132)
Nut, Self-Locking (WP 0295, Table 1, Item 178)
Washer, Lock

Materials/Parts (cont.)
Qty: (4) (WP 0295, Table 1, Item 191)
Washer, Lock
Qty: (6) (WP 0295, Table 1, Item 192)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

NOTE
Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Remove six screws (Figure 1, Item 5), and lockwashers (Figure 1, Item 4), access cover (Figure 1, Item 3), and gasket (Figure 1, Item 2) from access hole (Figure 1, Item 1). Discard gasket (Figure 1, Item 2) and lockwashers (Figure 1, Item 4).

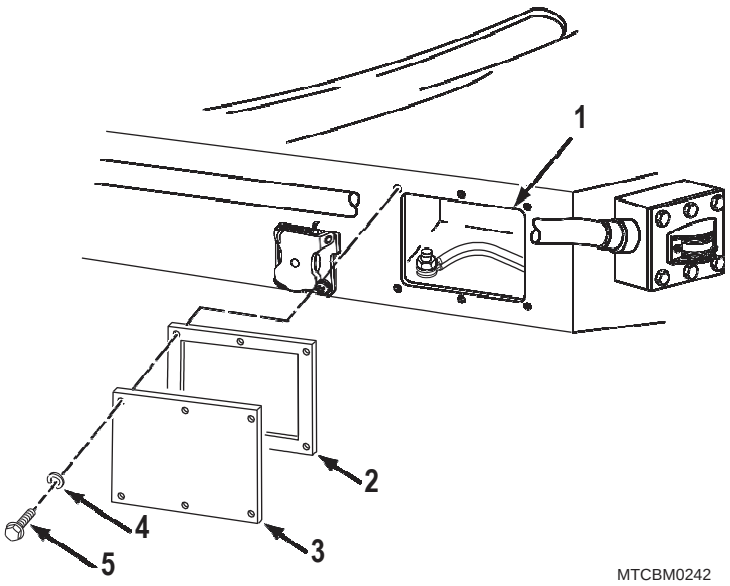


Figure 1. Access Cover Removal.

REMOVAL - Continued

2. From inside access hole (Figure 2, Item 3), disconnect lead connectors (Figure 2, Items 8, 9, 10, 11, 13, and 14) of electrical intervehicular wiring harness lead assembly (Figure 2, Item 7) from lead connectors (Figure 2, Item 18) of main trailer wiring harness (Figure 2, Item 17).
3. From inside access hole (Figure 2, Item 3), remove screw (Figure 2, Item 6) and self-locking nut (Figure 2, Item 1) fastening two ground leads (Figure 2, Items 2 and 5) of electrical intervehicular wiring harness lead assembly (Figure 2, Item 7) to bulkhead (Figure 2, Item 4). Discard self-locking nut (Figure 2, Item 1).
4. Disconnect lead 489 connector (Figure 2, Item 16) of front marker lights lead assembly (Figure 2, Item 15) from lead 21-489 connector (Figure 2, Item 12) of electrical intervehicular wiring harness lead assembly (Figure 2, Item 7).
5. Remove four screws (Figure 2, Item 19) and lockwashers (Figure 2, Item 20), electrical cover (Figure 2, Item 21), electrical intervehicular wiring harness lead assembly (Figure 2, Item 7) and gasket (Figure 2, Item 22) from semitrailer (Figure 2, Item 23). Discard lockwashers (Figure 2, Item 20) and gasket (Figure 2, Item 22).

END OF TASK

INSTALLATION

1. Install four screws (Figure 2, Item 19), and new lockwashers (Figure 2, Item 20), electrical cover (Figure 2, Item 21), electrical intervehicular wiring harness lead assembly (Figure 2, Item 7), and new gasket (Figure 2, Item 22) on semitrailer (Figure 2, Item 23).
2. Connect lead 489 connector (Figure 2, Item 16) of front marker lights lead assembly (Figure 2, Item 15) to lead 21- 489 connector (Figure 2, Item 12) of electrical intervehicular wiring harness lead assembly (Figure 2, Item 7).
3. Inside access hole (Figure 2, Item 3), install two ground leads (Figure 2, Items 2 and 5) of electrical intervehicular wiring harness lead assembly (Figure 2, Item 7), screw (Figure 2, Item 6) and new self-locking nut (Figure 2, Item 1) on bulkhead (Figure 2, Item 4).
4. Inside access hole (Figure 2, Item 3), connect lead connectors (Figure 2, Items 8, 9, 10, 11, 13, and 14) of electrical intervehicular wiring harness lead assembly (Figure 2, Item 7) to lead connectors (Figure 2, Item 18) of main trailer wiring harness (Figure 2, Item 17).

INSTALLATION - Continued

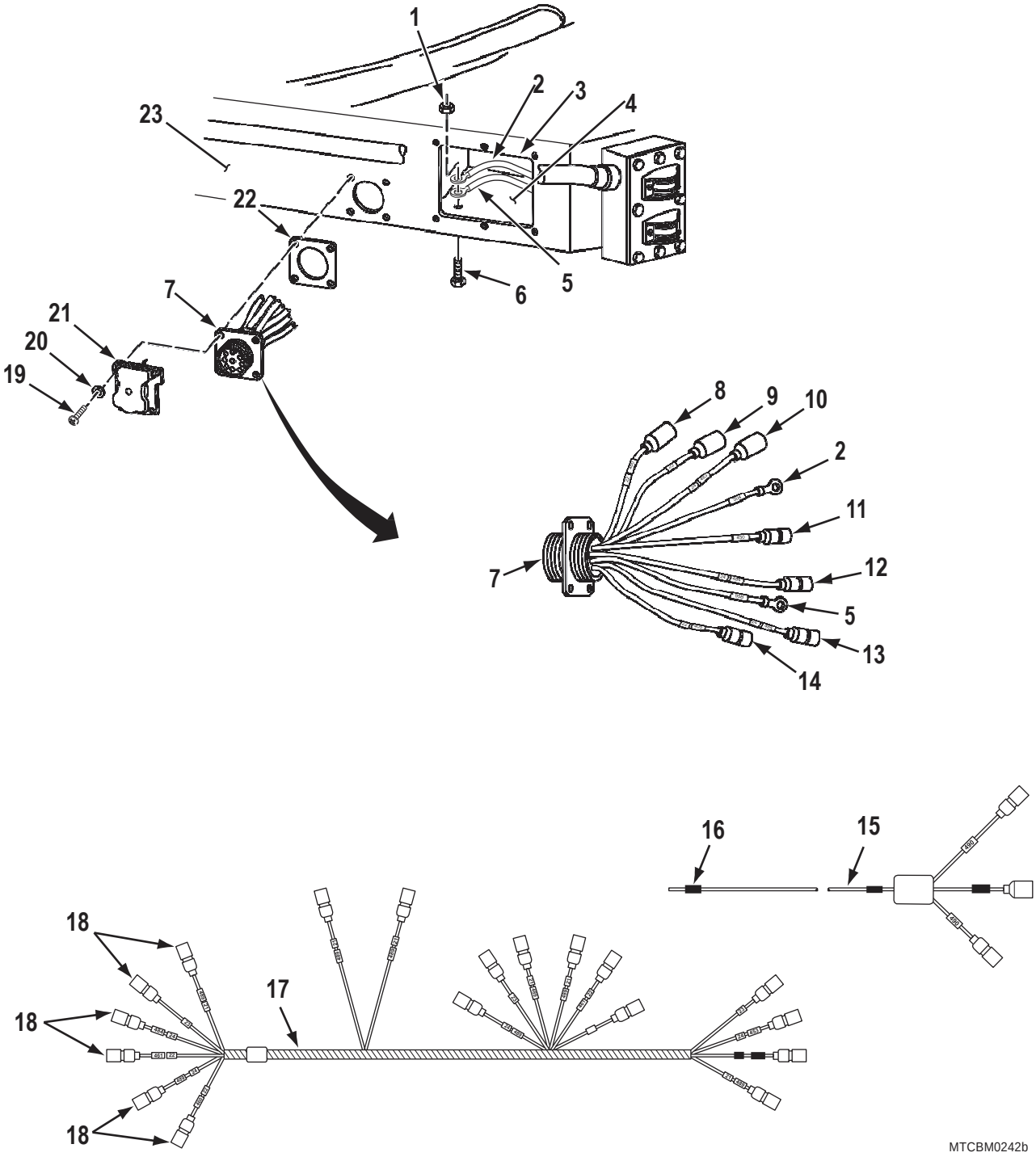


Figure 2. Lead Assembly Replacement.

INSTALLATION - Continued

5. Install six screws (Figure 3, Item 5) and new lockwashers (Figure 3, Item 4), access cover plate (Figure 3, Item 3), and new gasket (Figure 3, Item 2) on access hole (Figure 3, Item 1).

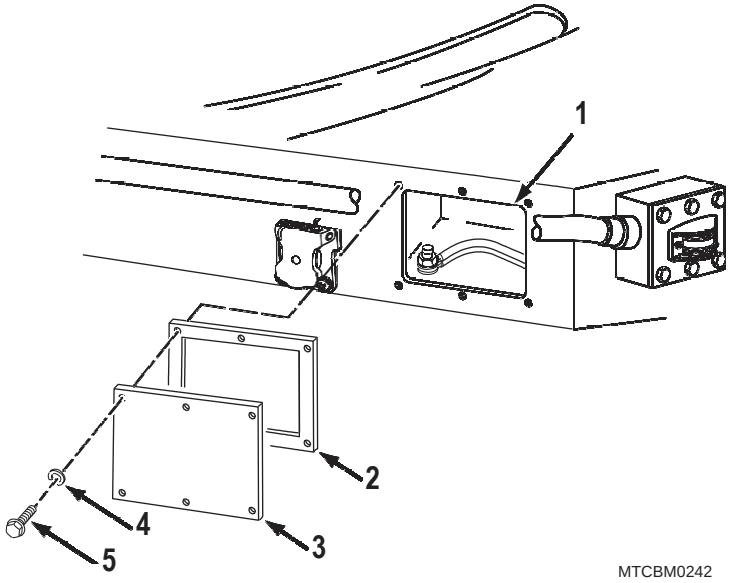


Figure 3. Access Cover Installation.

END OF TASK

FOLLOW ON TASK

Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
REAR BLACKOUT MARKER LIGHT LEAD ASSEMBLY (M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Curbside composite light cover plate removed
(WP 0094)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

REMOVAL

1. From inside roadside and curbside composite light boxes (Figure 1, Items 1 and 2), tag and disconnect lead 490 connectors (Figure 1, Items 4 and 5) of wiring harness (Figure 1, Item 6) from lead 490 connectors of blackout clearance lights (Figure 1, Items 3 and 7). From inside curbside light box (Figure 1, Item 2), cut lead 490 connectors (Figure 1, Item 5) from lead 490.

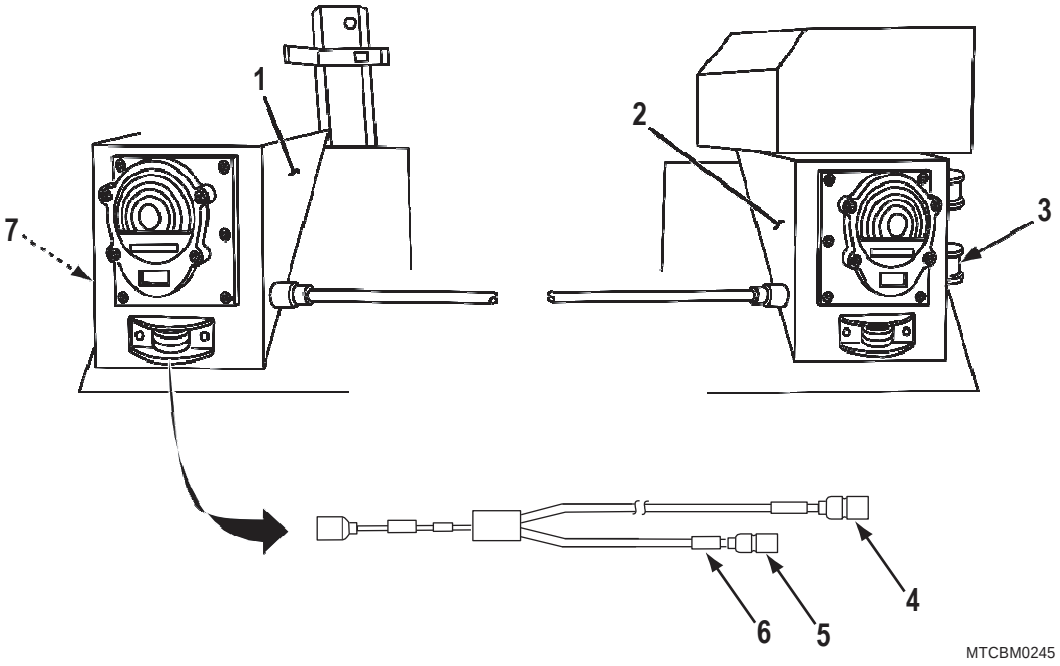


Figure 1. Lead Assembly Removal.

REMOVAL - Continued

2. From inside roadside composite light box (Figure 2, Item 1), tag and disconnect lead 490 connector (Figure 2, Item 9) of wiring harness (Figure 2, Item 8) from lead 490 connector (Figure 2, Item 5) of front blackout marker lights wiring harness (Figure 2, Item 10).
3. Pull wiring harness (Figure 2, Item 8) through conduit (Figure 2, Item 2) and out through roadside composite light box (Figure 2, Item 1).

END OF TASK

INSTALLATION

1. Pull lead 490 (Figure 2, Item 6) through conduit (Figure 2, Item 2) and out through curbside composite light box (Figure 2, Item 3).
2. Install new connector on lead 490 (Figure 2, Item 6).
3. Inside roadside composite light box (Figure 2, Item 1). connect lead 490 connector (Figure 2, Item 9) of wiring harness (Figure 2, Item 8) to lead 490 connector (Figure 2, Item 5) of front blackout marker lights wiring harness (Figure 2, Item 10).
4. Inside roadside and curbside composite light boxes (Figure 2, Items 1 and 3), connect two lead 490 connectors (Figure 2, Items 6 and 7) of wiring harness (Figure 2, Item 8) to lead 490 connectors of two blackout clearance lights (Figure 2, Items 4 and 11).

INSTALLATION - Continued

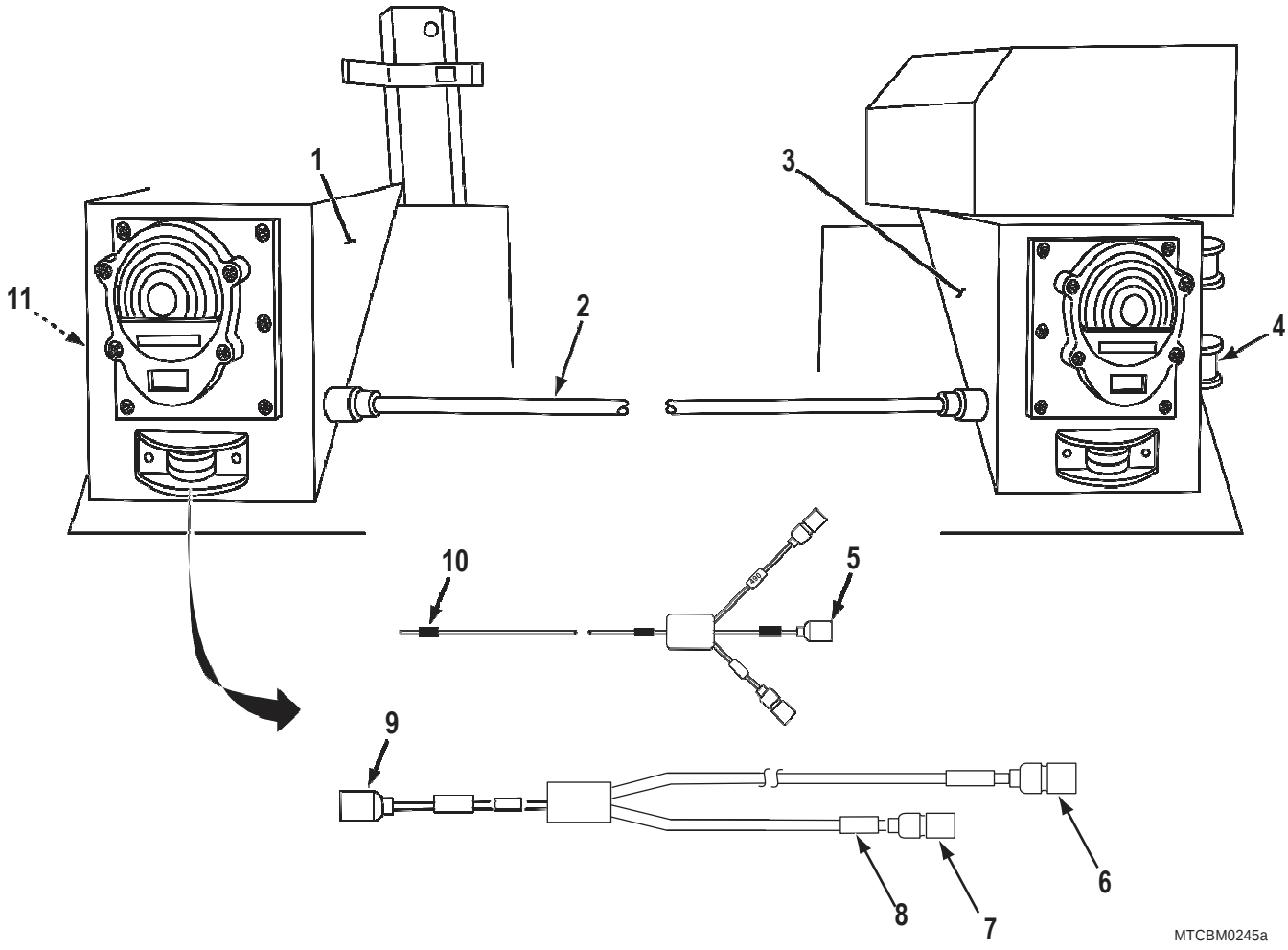


Figure 2. Lead Assembly Installation.

END OF TASK

FOLLOW ON TASK

1. Disconnect ground (WP 0008).
2. Install curbside composite light cover plate (WP 0094).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ELECTRICAL LEAD ASSEMBLY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Tag, Marker (WP 0293, Table 1, Item 28)

Equipment Condition
Engine control panel removed (WP 0004)

Equipment Condition (cont.)
Negative battery cables disconnected (WP 0098)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Disconnect all electrical leads (Figure 1, Item 3), jumper assemblies (Figure 1, Item 2), and electrical components (Figure 1, Item 1) from electrical lead assembly (Figure 1, Item 4).

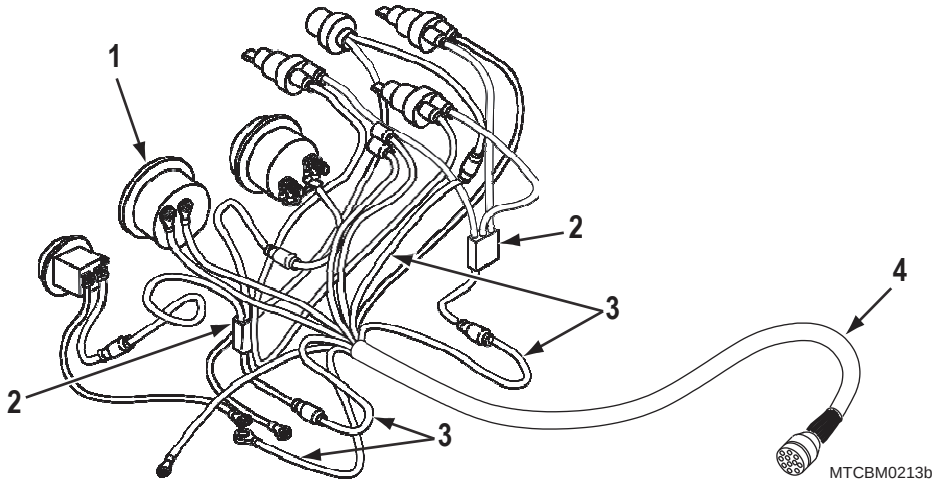


Figure 1. Electrical Lead Disconnection.

2. Disconnect control panel electrical lead assembly conduit (Figure 2, Item 1) from back of control panel (Figure 2, Item 2).

NOTE

Connectors must be removed in order to pull electrical lead assembly through conduit.

3. Cut connectors from electrical lead assembly (Figure 2, Item 4) and pull through conduit (Figure 2, Item 1).
4. Disconnect electrical lead assembly (Figure 2, Item 4) from electrical box (Figure 2, Item 3) and remove lead assembly (Figure 2, Item 4).

END OF TASK

INSTALLATION

NOTE

Use lacing wire, electrical wire, string, or other suitable material to help pull lead assembly through conduit.

1. Pull lead assembly (Figure 2, Item 4) through conduit (Figure 2, Item 1).
2. Install new connectors on each electrical lead assembly lead.
3. Install conduit (Figure 2, Item 1) on back of control panel (Figure 2, Item 2).
4. Connect electrical leads (Figure 1, Item 3), jumper assemblies (Figure 1, Item 2), and electrical components (Figure 1, Item 1) to lead assembly (Figure 1, Item 4).

INSTALLATION - Continued

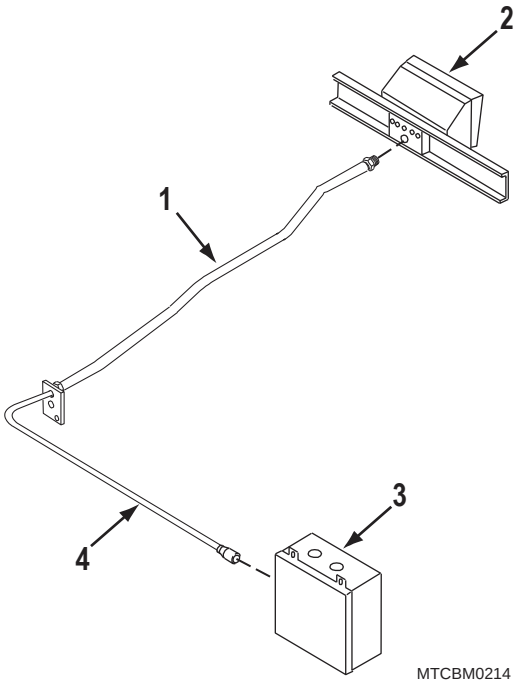


Figure 2. Electrical Lead Removal.

END OF TASK

FOLLOW ON TASK

1. Install engine control panel (WP 0004).
2. Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
WIRING HARNESS AND LEAD ASSEMBLY REPAIR

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Crimping Tool, Terminal
(WP 0294, Table 1, Item 2)

Materials/Parts
Tape, Insulation, Electrical

Materials/Parts (cont.)
(WP 0293, Table 1, Item 30)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

DISASSEMBLY

NOTE

This task applies to all wiring harnesses and lead assemblies. See illustration for location of wiring harnesses and lead assemblies.

1. Remove any loose or damaged connectors from wiring harness/lead assembly.

NOTE

Remove electrical insulation tape only from section of wiring harness/lead assembly to be disassembled.

2. Remove electrical insulation tape from section of wiring harness/lead assembly.
3. Separate and isolate wiring harness/lead assembly branches.
4. Disassemble each wiring harness/lead assembly branch and replace defective wires.

END OF TASK

ASSEMBLY

1. Assemble each wiring harness/lead assembly branch.
2. Group wiring harness/lead assembly branches and secure with electrical insulation tape.
3. Install new connectors on wiring harness/lead assembly as required.

ASSEMBLY - Continued

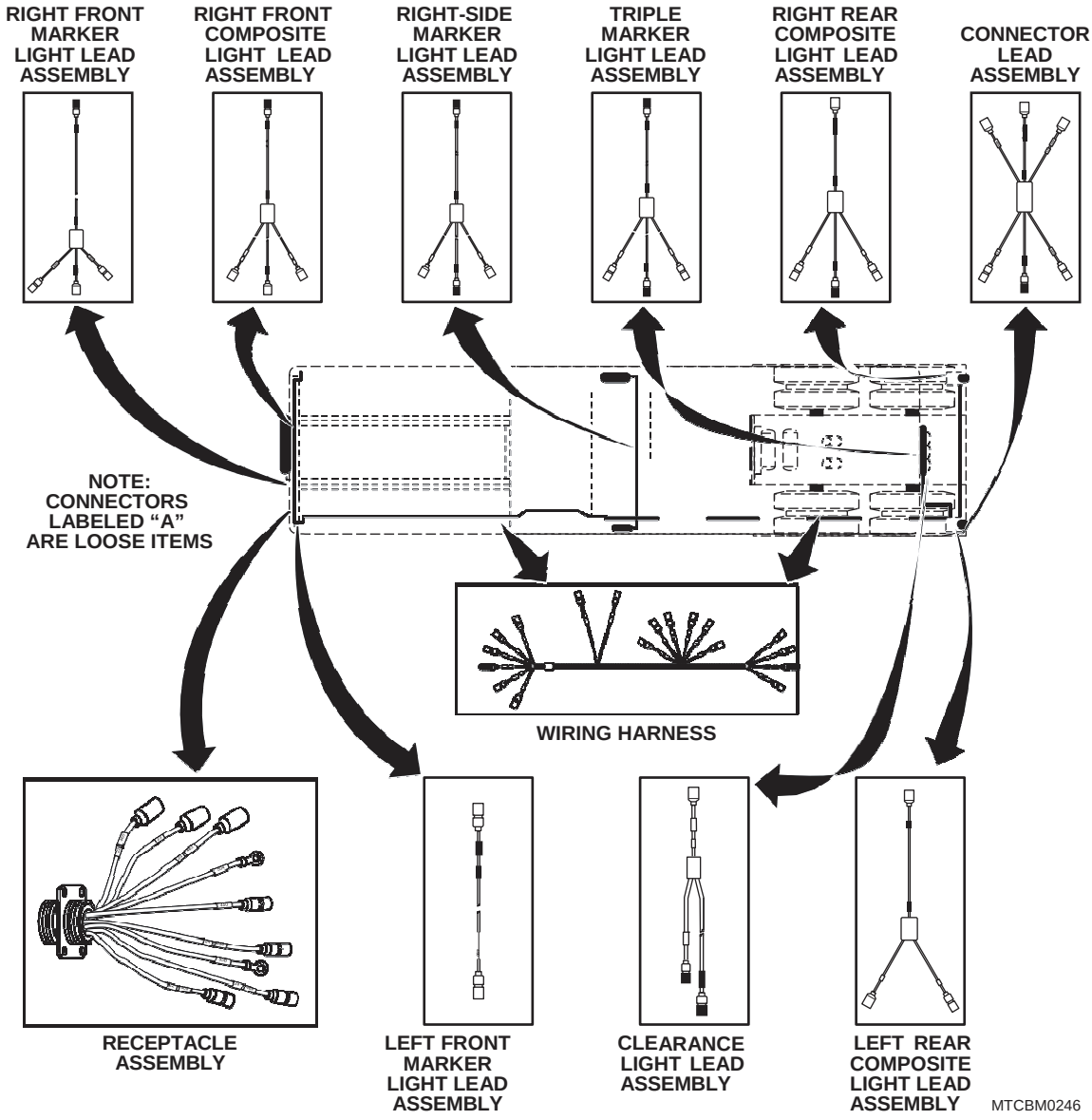


Figure 1. Wiring Harness/Lead.

END OF TASK

FOLLOW ON TASK

Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
WIRING HARNESS COMPONENTS REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Negative battery cables disconnected (WP 0098)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

REMOVAL

NOTE

Use Figure 1 as reference when removing conduit.

Where conduit passes under clips, bend clips far enough back to remove conduit, but do not break off clips.

END OF TASK

INSTALLATION

NOTE

Use Figure 1 as reference when installing conduit.

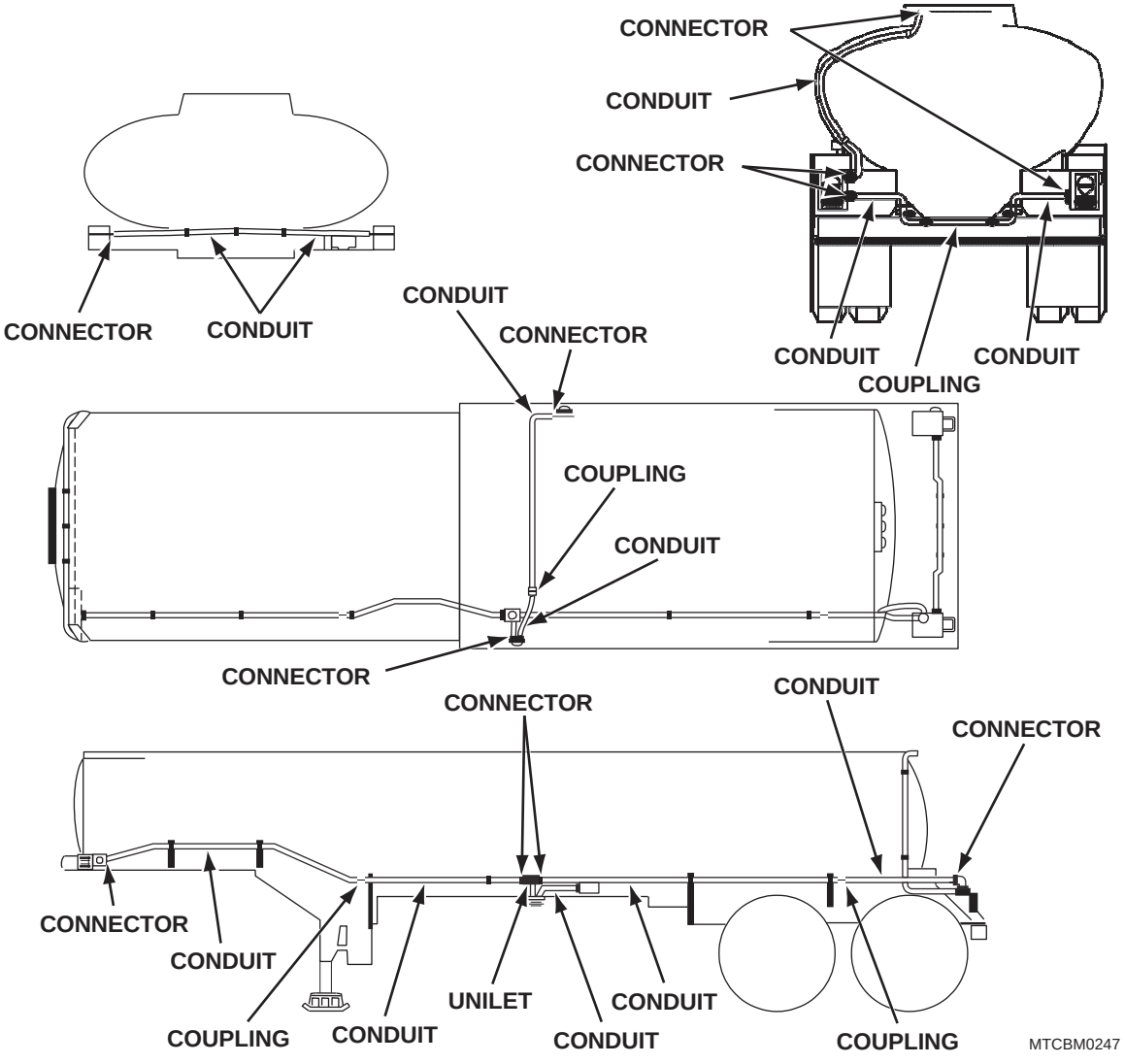


Figure 1. Wiring Harness Components.

INSTALLATION - Continued

If enough clips break off to hamper installation of conduit, reattach on new clips.

END OF TASK

FOLLOW ON TASK

1. Disconnect ground (WP 0008).
2. Connect negative battery cables (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AXLE REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Jack, Dolly Type, Hydraulic
(WP 0294, Table 1, Item 13)
Wrench Set, Socket
(WP 0294, Table 1, Item 23)
Wrench, Torque (WP 0294, Table 1, Item 26)

Materials/Parts
Bolt, U (WP 0295, Table 1, Item 8)
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 72)
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 117)

Personnel Required
Two

Equipment Condition
Semitrailer uncoupled (WP 0007)
Tire and wheel assembly removed (WP 0084)
Air released from air reservoirs (WP 0126)
Hub and drum assembly removed (WP 0136)
Brakes removed (WP 0121)
Brake actuating camshaft removed (WP 0119)
Slack adjuster removed (WP 0123)
Air brake chamber removed (WP 0125)

WARNING

- Weight of semitrailer, 13,745 lb (6,234.6 kg) to 16,350 lb (7,416.24 kg), must be supported on suitable support at all times. Actual weight for the semitrailer model can be found in (WP 0002). Do not support weight of semitrailer on lifting device. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Lifting device must have a weight capacity greater than 16,350 lb (7,416.24 kg), the weight of the semitrailer and cargo. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

REMOVAL

NOTE

Components removed from axle listed in equipment condition can be performed after axle is removed.

1. Using suitable lifting device, raise rear of semitrailer until weight of both suspension springs (Figure 1, Item 4) has been removed from axle (Figure 1, Item 2). Support or crib semitrailer frame securely.
2. Position and raise two suitable supports in place to support axle (Figure 1, Item 5).
3. Remove four self-locking nuts (Figure 1, Item 7), washers (Figure 1, Item 8), and screws (Figure 1, Item 1) from spring end cap (Figure 1, Item 11) and spring seat (Figure 1, Item 9) on axle (Figure 1, Item 5). Discard self-locking nuts (Figure 1, Item 7).
4. Remove four self-locking nuts (Figure 1, Item 2) and eight washers (Figure 1, Item 3) and two U-bolts (Figure 1, Item 6) from spring seat (Figure 1, Item 9) and spring end cap (Figure 1, Item 11) on axle (Figure 1, Item 5). Discard U-bolts (Figure 1, Item 6) and self-locking nuts (Figure 1, Item 2).
5. Remove spring seat (Figure 1, Item 9) and two cushioning pads (Figure 1, Item 10) from axle (Figure 1, Item 5).
6. Repeat Steps 4 through 6 for other side of axle (Figure 1, Item 5).
7. Using suitable support, slowly lower and remove axle (Figure 1, Item 5) from under semitrailer.

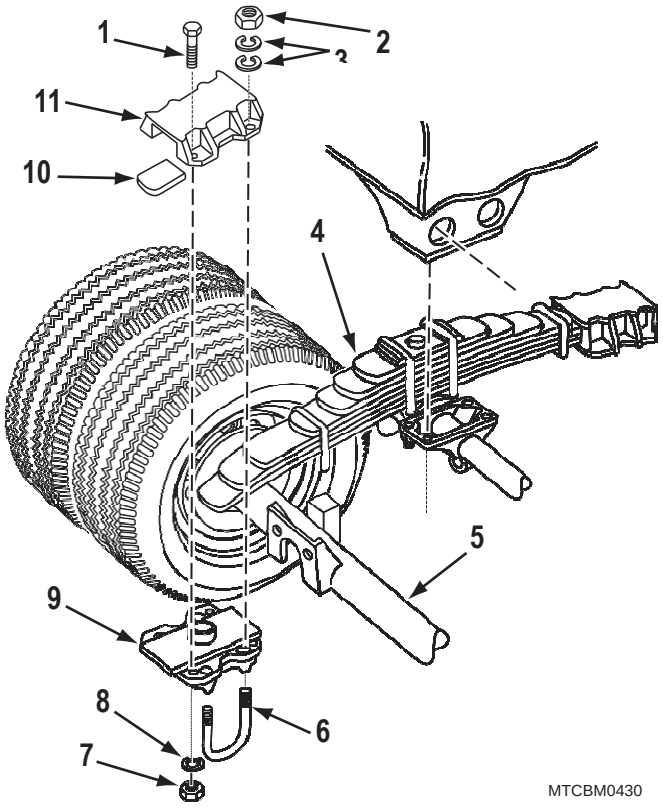


Figure 1. Axle Replacement.

END OF TASK

INSTALLATION

1. Using suitable support, position axle (Figure 1, Item 5) in place under semitrailer. Raise support and rotate axle into position on ends of both suspension springs (Figure 1, Item 4).
2. At each end of axle (Figure 1, Item 5), loosely install spring seat (Figure 1, Item 9), two cushioning pads (Figure 1, Item 10), and spring end cap (Figure 1, Item 11) with two new U-bolts (Figure 1, Item 6), eight washers (Figure 1, Item 3), and four new self-locking nuts (Figure 1, Item 2).
3. At each end of axle (Figure 1, Item 5), loosely install spring end cap (Figure 1, Item 11) on spring seat (Figure 1, Item 9) on axle (Figure 1, Item 5) with four screws (Figure 1, Item 1), washers (Figure 1, Item 8), and new self-locking nuts (Figure 1, Item 7).
4. Torque eight nuts (Figure 1, Items 2 and 7) evenly between 200-320 lb ft (271-434 N·m).
5. Position supports or cribbing under axle (Figure 1, Item 5). Lower and remove suitable supports.
6. Using suitable lifting device, raise rear of semitrailer and remove supports or cribbing. Lower semitrailer to ground.

END OF TASK

FOLLOW ON TASK

1. Install air brake chambers (WP 0125).
2. Install slack adjuster (WP 0123).
3. Install brake actuating camshaft (WP 0119).
4. Install brakes (WP 0121).
5. Install hub and drum assembly (WP 0136).
6. Install tire and wheel assembly (WP 0084).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AXLE ALIGNMENT

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Tool Kit, Welder's (WP 0294, Table 1, Item 20)
- Wrench Set, Socket (WP 0294, Table 1, Item 23)
- Wrench, Torque (WP 0294, Table 1, Item 25)
- Wrench, Torque (WP 0294, Table 1, Item 26)

Materials/Parts
- Nut, Self-Locking
  - Qty: (8) (WP 0295, Table 1, Item 72)
- Nut, Self-Locking
  - Qty: (8) (WP 0295, Table 1, Item 117)

References
- TC 9-237

AXLE ALIGNMENT

1. Be certain spring seats fit axle properly. If necessary, grind seats to ensure that both spring seats fit properly and are horizontal and parallel (Figure 1).
2. Make sure that spring seats are level, parallel, an equal distance from center of axle, and the same distance from the brake flanges (Figure 1).

NOTE

Front axle should be aligned in relation to semitrailer kingpin.

3. If necessary, tack weld spring seats in place (Figure 1) and recheck in accordance with TC 9-237.

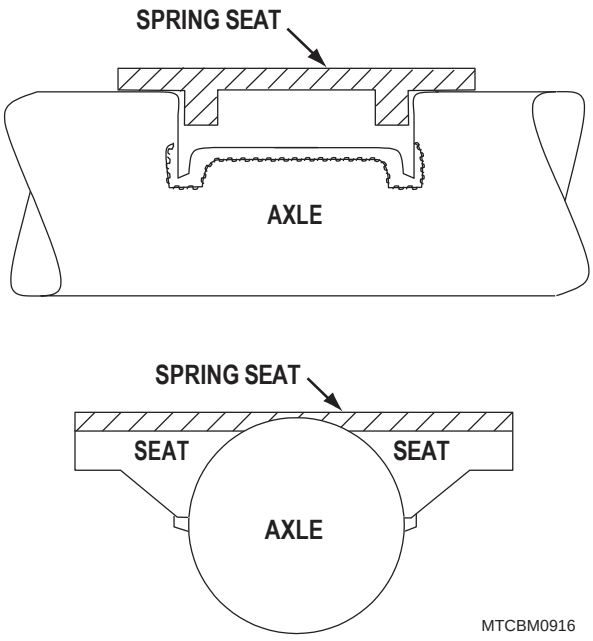


Figure 1. Spring Seat Installation.

AXLE ALIGNMENT - Continued

4. Check front axle alignment. Measure distance from kingpin to center line of the spindles on front axle as shown in (Figure 2). Measurements must be equal.
5. If front axle needs alignment, proceed to next Step 6. If not, proceed to Step 15.

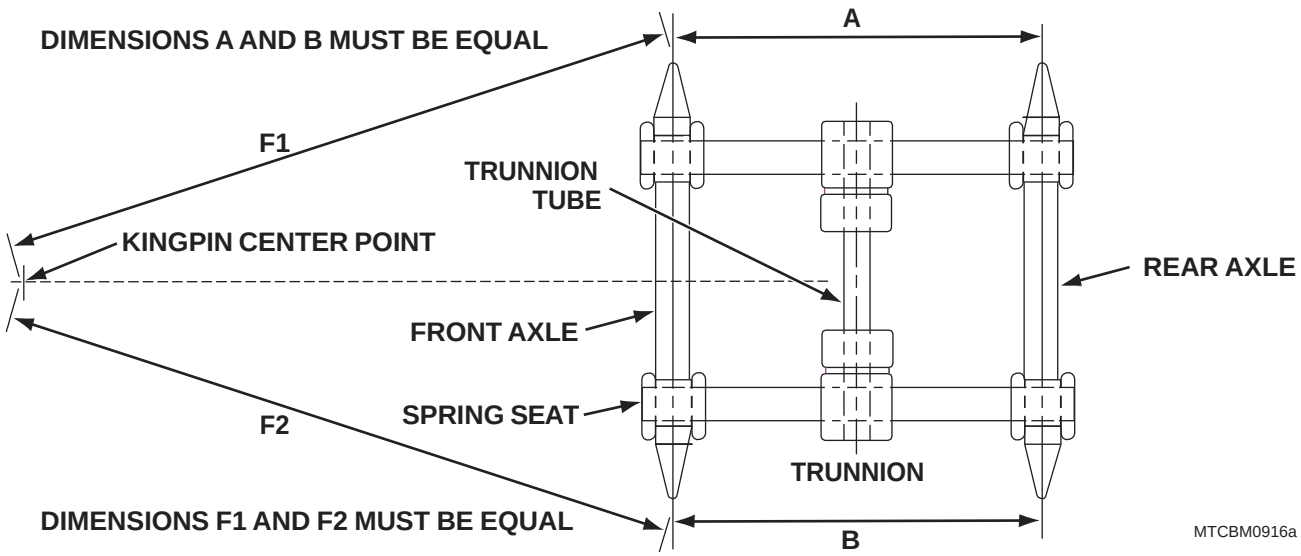


Figure 2. Axle Alignment.

6. Remove four self-locking nuts (Figure 3, Item 4) from spring seat (Figure 3, Item 5) on front axle (Figure 3, Item 6).
7. Install four new self-locking nuts (Figure 3, Item 4) on spring seat (Figure 3, Item 5) on front axle (Figure 3, Item 6). Do not tighten.
8. Remove four self-locking nuts (Figure 3, Item 2) from U-bolts (Figure 3, Item 3) and spring cap (Figure 3, Item 1) on front axle (Figure 3, Item 6).
9. Install four self-locking nuts (Figure 3, Item 2) on U-bolts (Figure 3, Item 3) and spring cap (Figure 3, Item 1) front axle (Figure 3, Item 6). Do not tighten.
10. Repeat Steps 6 through 9 for other side of axle.
11. Align front axle. Measure distance from kingpin to center line of the spindles on front axle, as shown in (Figure 2). Measurements must be equal.
12. Torque self-locking nuts (Figure 3, Item 4) to 180 lb ft (244 N·m).
13. Recheck alignment of front axle with kingpin.
14. Torque self-locking nuts (Figure 3, Item 2) to 300 lb ft (407 N·m).

AXLE ALIGNMENT - Continued

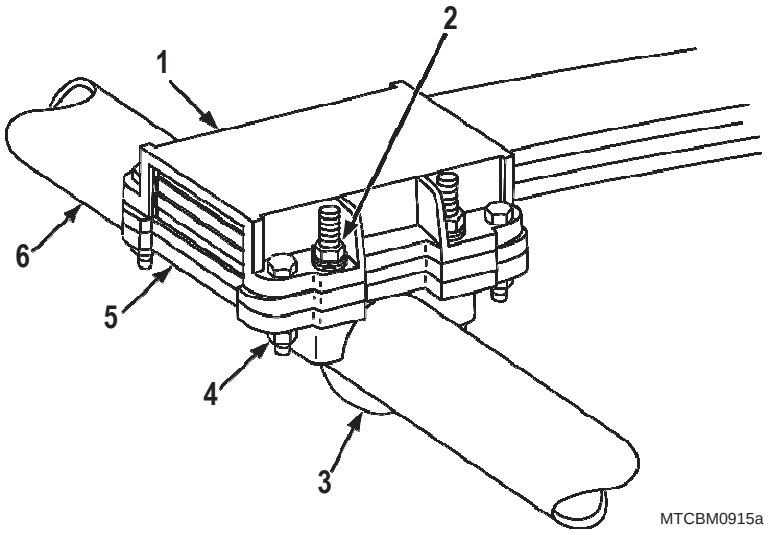


Figure 3. Securing Axle.

15. Check rear axle alignment. Measure an equal distance from front axle to rear axle as shown in (Figure 2, Items A and B).
16. If rear axle needs alignment, proceed to next Step 17. If not, proceed to end of work package.
17. Remove four self-locking nuts (Figure 3, Item 4) from spring seat (Figure 3, Item 5) on rear axle (Figure 3, Item 6).
18. Install four new self-locking nuts (Figure 3, Item 4) on spring seat (Figure 3, Item 5) on rear axle (Figure 3, Item 6). Do not tighten.
19. Remove self-locking nuts (Figure 3, Item 2) from U-bolts (Figure 3, Item 3) and spring cap (Figure 3, Item 1) on rear axle (Figure 3, Item 6).
20. Install four self-locking nuts (Figure 3, Item 2) on U-bolts (Figure 3, Item 3) and spring cap (Figure 3, Item 1) on rear axle (Figure 3, Item 6). Do not tighten.
21. Repeat Steps 17 through 20 for other side of axle (Figure 2, Item 9).
22. Align rear axle. Measure an equal distance from front axle to rear axle as shown in (Figure 2, Items A and B).
23. Torque self-locking nuts (Figure 3, Item 4) to 180 lb ft (244 N·m).
24. Recheck alignment of rear axle.
25. Torque self-locking nuts (Figure 3, Item 2) to 300 lb ft (407 N·m).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BOGIE ASSEMBLY REPLACEMENT (M967A1, M969A1, AND M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Jack, Dolly Type (WP 0294, Table 1, Item 13)
Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (8) (WP 0295, Table 1, Item 160)

Equipment Condition
Air released from air reservoirs (WP 0082)
Fail-safe chamber manually caged (WP 0017)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

- Weight of semitrailer, 13,745 lb (6,234.6 kg) to 16,350 lb (7,416.24 kg), must be supported on suitable support at all times. Actual weight for the semitrailer model can be found in (WP 0002). Do not support weight of semitrailer on lifting device. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Lifting device must have a weight capacity greater than 16,350 lb (7,416.24 kg), the weight of the semitrailer and cargo. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Using suitable lifting device, raise rear of semitrailer until weight of semitrailer has been removed from two suspension springs (Figure 1, Item 8) and axle (Figure 1, Item 4). Support or crib semitrailer securely.
2. Disconnect eight hoses (Figure 1, Item 3) from four air brake chambers (Figure 1, Item 2) on two axles (Figure 1, Item 4).
3. Position two suitable lifting devices under trunnion tube (Figure 1, Item 6) close to inside of each trunnion hanger (Figure 1, Item 7). Raise lifting devices to support weight of trunnion tube (Figure 1, Item 6).
4. Remove eight self-locking nuts (Figure 1, Item 5) and screws (Figure 1, Item 1) from trunnion hangers (Figure 1, Item 7) and two trunnion cross tube mounting brackets (Figure 1, Item 9). Discard self-locking nuts (Figure 1, Item 5).
5. Lower and remove lifting devices from under trunnion tube (Figure 1, Item 6).
6. Using suitable lifting device, raise semitrailer until it clears bogie assembly.
7. Manually release air brake chambers (Figure 1, Item 2).
8. Roll bogie assembly out from under rear of semitrailer.
9. Lower semitrailer onto supports or cribbing.

END OF TASK

INSTALLATION

1. Using suitable lifting device, raise rear of semitrailer high enough to allow bogie assembly to roll under rear of semitrailer. Remove supports or cribbing.
2. Roll bogie assembly into position under mounting brackets (Figure 1, Item 9) and trunnion hangers (Figure 1, Item 7) on each end of trunnion tube (Figure 1, Item 6).
3. Manually set air brake chambers (Figure 1, Item 2).
4. Position two suitable lifting devices at each end of trunnion tube (Figure 1, Item 6) as close as possible to inside of each trunnion hanger (Figure 1, Item 7).
5. Using suitable lifting device, raise semitrailer to within 1 in. (2.54 cm) of trunnion hangers (Figure 1, Item 7).
6. Align holes in mounting brackets (Figure 1, Item 9) with holes in trunnion hangers (Figure 1, Item 7).
7. Loosely install eight screws (Figure 1, Item 1) and new self-locking nuts (Figure 1, Item 5) in mounting brackets (Figure 1, Item 9) and trunnion hangers (Figure 1, Item 7).
8. Raise lifting devices until mounting brackets (Figure 1, Item 9) are seated against trunnion hangers (Figure 1, Item 7).
9. Torque eight self-locking nuts (Figure 1, Item 5) to 90 lb ft (122 N·m). Lower and remove lifting devices.
10. Connect eight hoses (Figure 1, Item 3) to four air brake chambers (Figure 1, Item 2) on two axles (Figure 1, Item 4) as tagged.

INSTALLATION - Continued

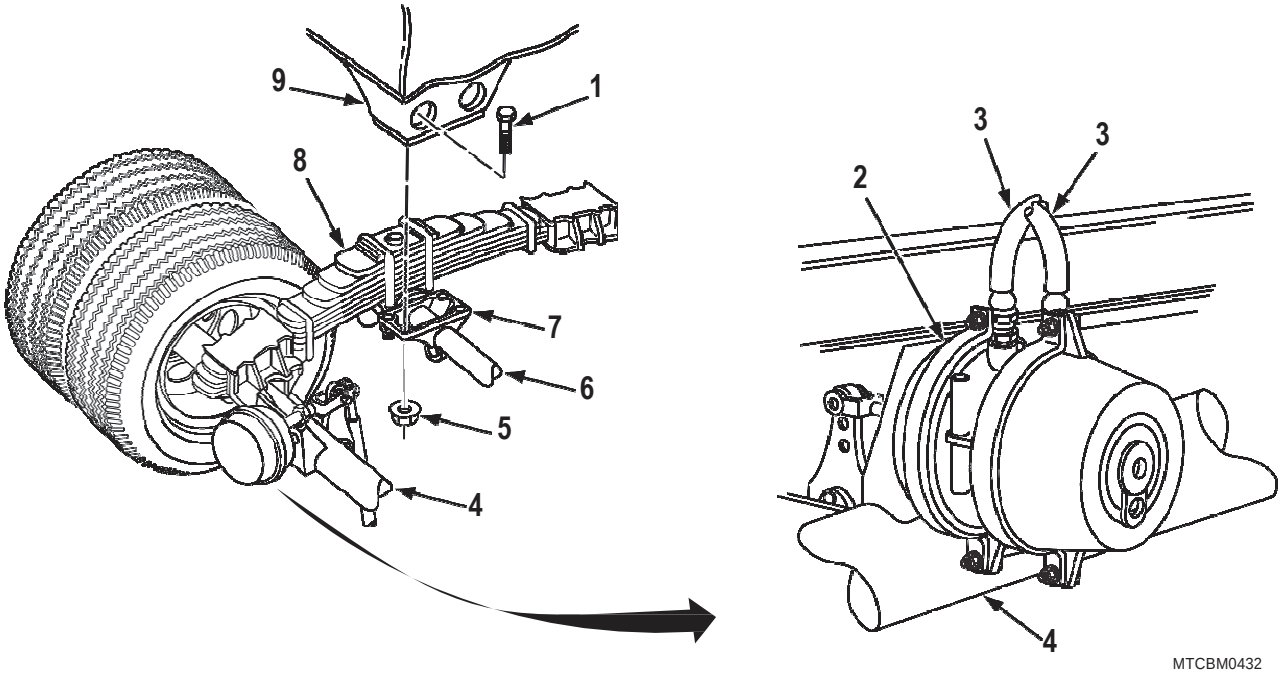


Figure 1. Bogie Assembly Replacement.

END OF TASK

FOLLOW ON TASK

1. Disconnect ground (WP 0008).
2. Uncage fail-safe chamber brakes (WP 0017).
3. Add air to air reservoirs (WP 0082).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BRAKE ACTUATING CAMSHAFT (P TYPE) REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Materials/Parts
Packing, Preformed
Qty: (2) (WP 0295, Table 1, Item 133)
Rag, Wiping (WP 0293, Table 1, Item 20)
Solvent, Cleaning Compound
(WP 0293, Table 1, Item 25)

References
WP 0286

Equipment Condition
Semitrailer uncoupled (WP 0007)
Hub and drum assembly removed
(WP 0135) (WP 0136)
Brake shoes removed WP 0120 (WP 0121)
Slack adjuster removed
(WP 0122) (WP 0123)

REMOVAL

1. Expand retaining ring (Figure 1, Item 2), slide camshaft (Figure 1, Item 1) partway out of spider (Figure 1, Item 3), and remove retaining ring (Figure 1, Item 2) from camshaft (Figure 1, Item 1).
2. Remove camshaft (Figure 1, Item 1) from spider (Figure 1, Item 3).

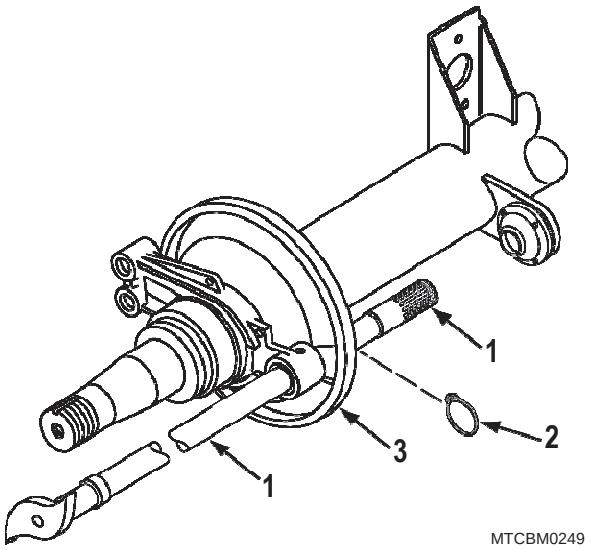


Figure 1. Brake Actuating Camshaft Removal.

REMOVAL - Continued

3. Remove grease fitting (Figure 2, Item 1) and two preformed packings (Figure 2, Item 12) from camshaft (Figure 2, Item 11).
4. Remove spider bushing (Figure 2, Item 13).
5. Remove four nuts (Figure 2, Item 10), washers (Figure 2, Item 9), and screws (Figure 2, Item 3) securing camshaft assembly to bracket (Figure 2, Item 7).
6. Remove inner retainer (Figure 2, Item 4) and outer retainer (Figure 2, Item 8).
7. Remove camshaft bushing (Figure 2, Item 6) and two preformed packings (Figure 2, Item 5).

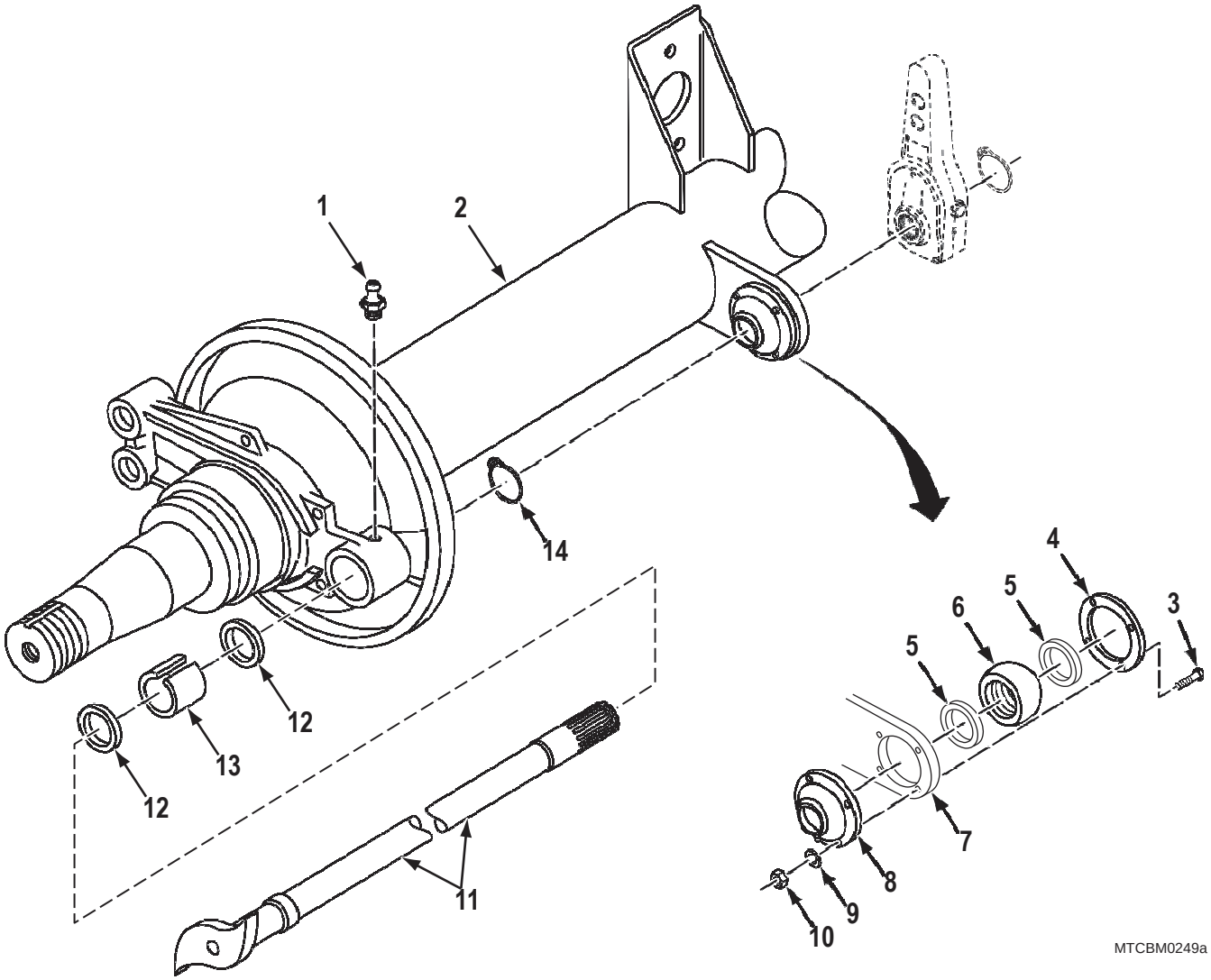


Figure 2. Brake Actuating Camshaft Maintenance.

END OF TASK

CLEANING AND INSPECTION

WARNING

- Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible; DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to equipment.

1. Clean all metal parts with solvent and clean dry rag. Dry all parts with compressed air.
2. Inspect camshaft (Figure 2, Item 11) for twists and bends. Replace if damaged.
3. Inspect inner and outer retainers (Figure 2, Items 4 and 8) for bends and cracks.

CLEANING AND INSPECTION - Continued

4. Inspect spider bushing (Figure 3, Item 13) and camshaft bushing (Figure 3, Item 6) for cracks and excessive wear. Replace if damaged.

END OF TASK

INSTALLATION

1. Assemble camshaft bushing (Figure 3, Item 6), two preformed packings (Figure 3, Item 5), inner retainer (Figure 3, Item 4), and outer retainer (Figure 3, Item 8) to bracket (Figure 3, Item 7).
2. Install four screws (Figure 3, Item 3), washers (Figure 3, Item 9), and nuts (Figure 3, Item 10) to secure camshaft bushing assembly to bracket (Figure 3, Item 7).
3. Install spider bushing (Figure 3, Item 13).

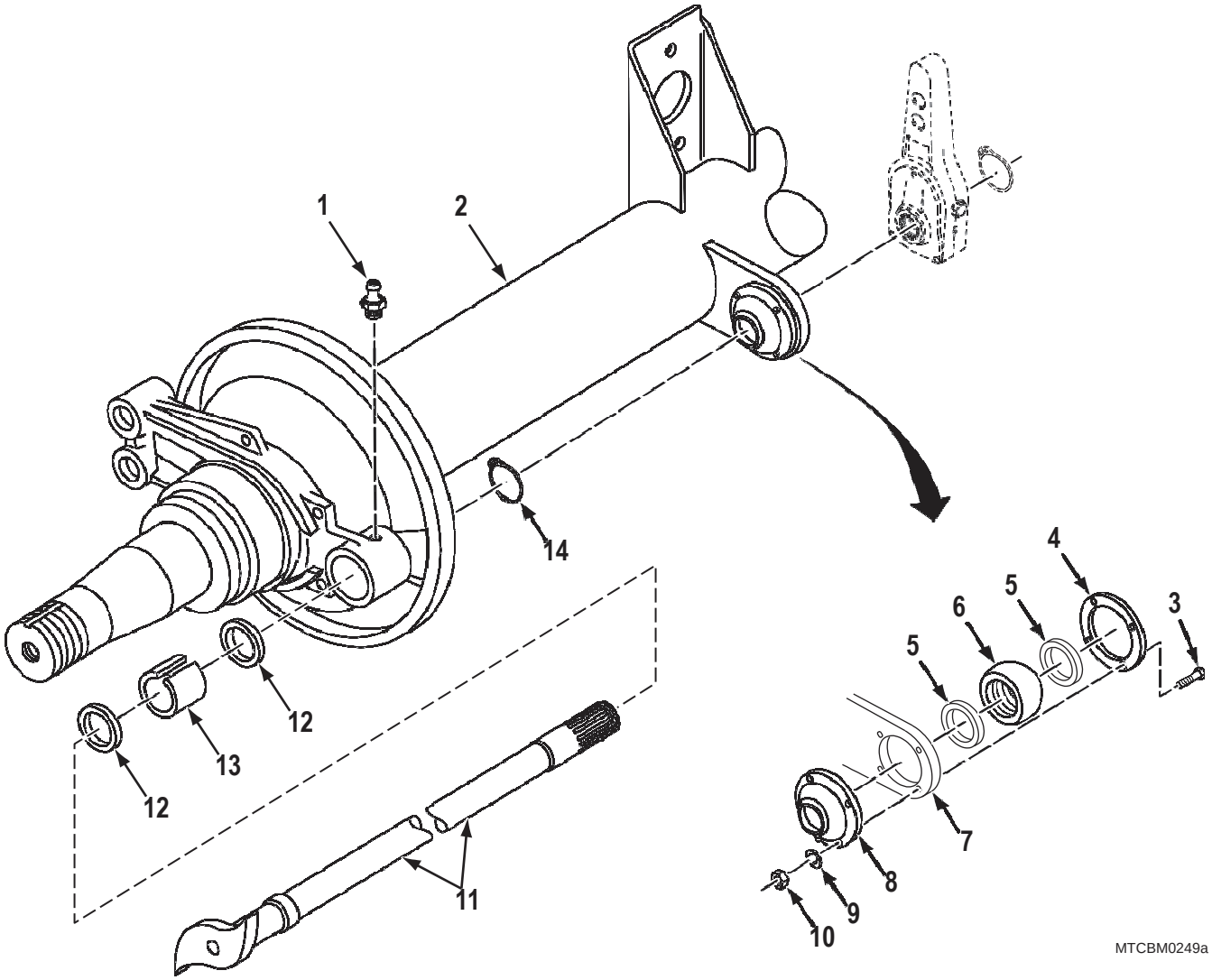


Figure 3. Brake Actuating Camshaft Installation.

INSTALLATION - Continued

4. Install two preformed packings (Figure 3, Item 12), retainer ring (Figure 3, Item 14), and grease fitting (Figure 3, Item 1) to camshaft (Figure 3, Item 11).
5. Install camshaft (Figure 3, Item 11) to spider (Figure 3, Item 2).
6. Expand retaining ring (Figure 3, Item 14) and slide over camshaft (Figure 3, Item 11).
7. Lock camshaft (Figure 3, Item 11) in place with retaining ring (Figure 3, Item 14).

END OF TASK

FOLLOW ON TASK

1. Install slack adjuster (WP 0122) or (WP 0123).
2. Install brake shoes (WP 0120) or (WP 0121).
3. Install hub and drum assembly (WP 0135) or (WP 0136).
4. Adjust slack adjuster (WP 0122) or (WP 0123).
5. Lubricate camshaft (WP 0286).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BRAKE ACTUATING CAMSHAFT (Q TYPE) REPLACEMENT (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
O-Ring Qty: (8) (WP 0295, Table 1, Item 18)
Rings, Retaining
Qty: (4) (WP 0295, Table 1, Item 39)
Washer, Lock
Qty: (16) (WP 0295, Table 1, Item 167)

References
TM 9-2330-339-23P
WP 0286

Equipment Condition
Semitrailer grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Axles supported (WP 0115)
Wheel assemblies removed (WP 0084)
Hub assemblies removed (WP 0136)
Brake shoes removed (WP 0121)
Slack adjusters removed (WP 0123)

WARNING

The axle must be firmly supported to prevent shifting of the semitrailer. Shift may cause serious injury to personnel and damage to equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

There are four brake camshafts. This procedure replaces one brake camshaft.

REMOVAL

1. Remove snap ring (Figure 1, Item 12), washer (Figure 1, Item 13), spacer (Figure 1, Item 14), and retainer bushing (Figure 1, Item 18) from camshaft (Figure 1, Item 1).
2. Remove retaining ring (Figure 1, Item 7), spacer (Figure 1, Item 6), washer (Figure 1, Item 3), four screws (Figure 1, Item 5), bushing retainer (Figure 1, Item 4), washer (Figure 1, Item 3), washer (Figure 1, Item 2), and camshaft (Figure 1, Item 1) from bracket (Figure 1, Item 19). Discard retaining ring (Figure 1, Item 7).
3. Remove four screws (Figure 1, Item 11), lockwashers (Figure 1, Item 10), washers (Figure 1, Item 9), retainer (Figure 1, Item 8), bushing bracket (Figure 1, Item 17), two O-rings (Figure 1, Item 16), and retainer bushing (Figure 1, Item 18). Discard lockwashers (Figure 1, Item 10), and O-rings (Figure 1, Item 16).
4. Remove lubrication fitting (Figure 1, Item 15) from retainer (Figure 1, Item 8).

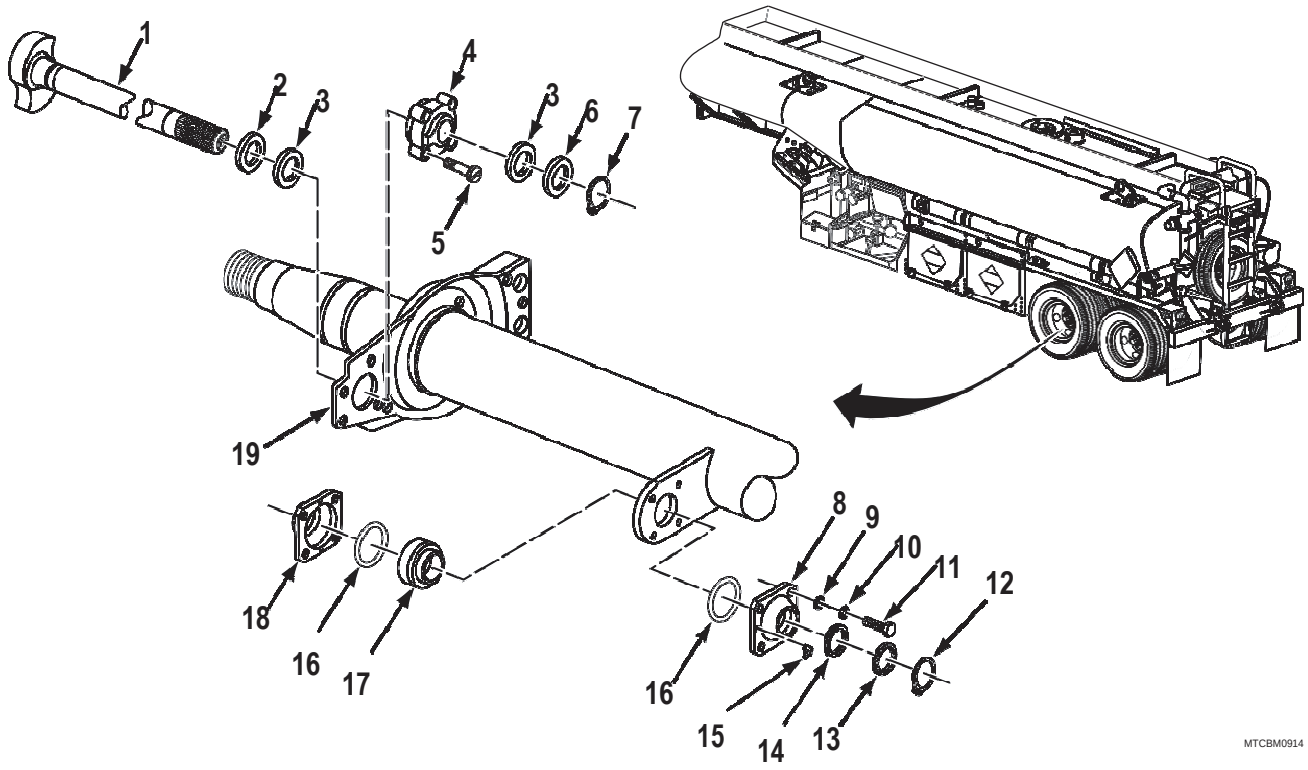


Figure 1. Brake Actuating Camshaft Removal.

END OF TASK

CLEANING AND INSPECTION

WARNING

- Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible; DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Clean all metal parts with solvent and clean dry rag. Dry all parts with compressed air.
2. Inspect camshaft (Figure 1, Item 6) for twists and bends. Replace if damaged.
3. Inspect spider bushing (Figure 1, Item 5) for cracks and excessive wear. Replace if damaged.

END OF TASK

INSTALLATION

1. Install lubrication fitting (Figure 2, Item 15) to retainer bushing (Figure 2, Item 8).
2. Install two new O-rings (Figure 2, Item 16), bushing bracket (Figure 2, Item 17), retainer (Figure 2, Item 8), four washers (Figure 2, Item 9), new lockwashers (Figure 2, Item 10), and screws (Figure 2, Item 11) to retainer bushing (Figure 2, Item 18).
3. Install washer (Figure 2, Item 2), washer (Figure 1, Item 3), and camshaft (Figure 2, Item 1) through bracket (Figure 2, Item 19) to bushing retainer (Figure 2, Item 4) and secure with four screws (Figure 2, Item 5), washer (Figure 2, Item 3), spacer (Figure 2, Item 6), and new retaining ring (Figure 2, Item 7).
4. Install retainer bushing (Figure 2, Item 18), spacer (Figure 2, Item 14), washer (Figure 2, Item 13), and snap ring (Figure 2, Item 12) to camshaft (Figure 2, Item 1).

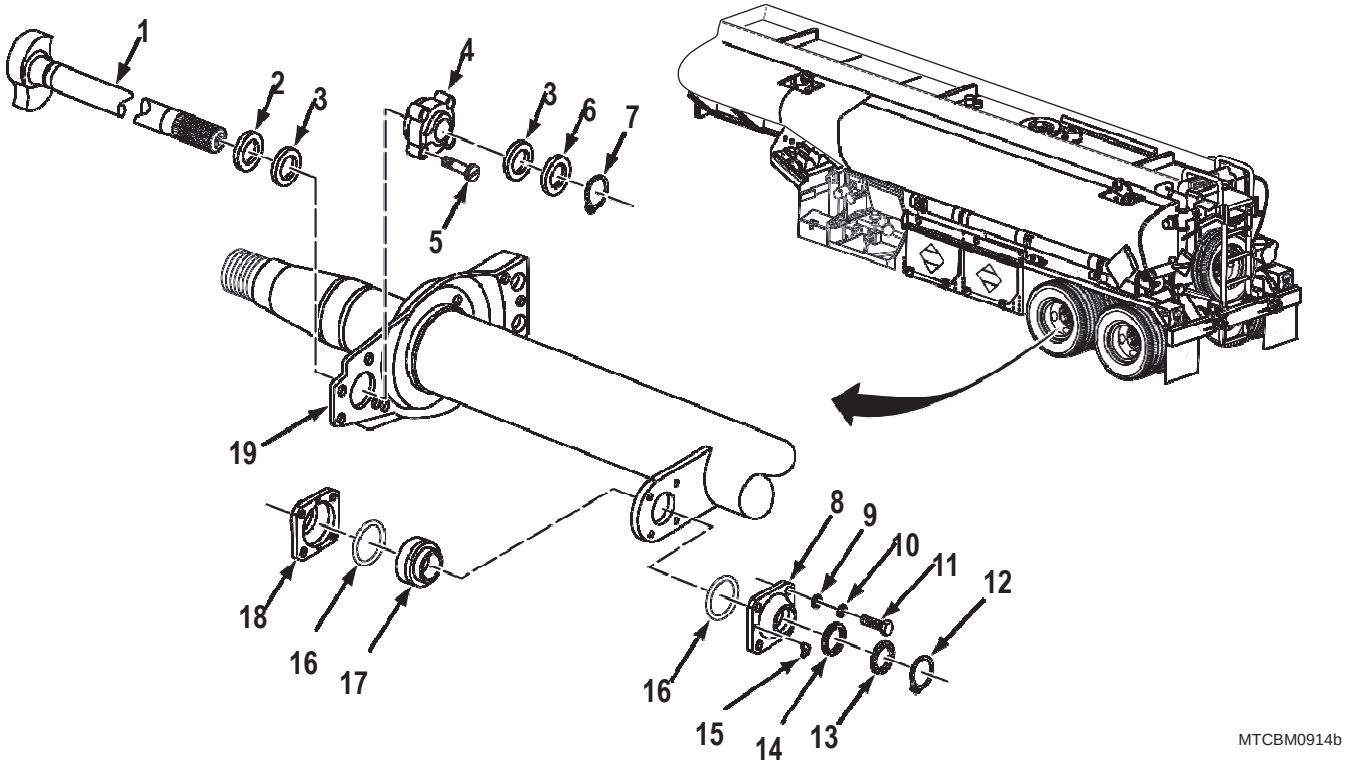


Figure 2. Brake Actuating Camshaft Installation.

5. Lubricate camshaft (WP 0286).

END OF TASK

FOLLOW ON TASK

1. Install brake shoes (WP 0121).
2. Install hub assemblies (WP 0136).
3. Install slack adjusters (WP 0123).
4. Install wheel assemblies (WP 0084).
5. Adjust brakes (WP 0121).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BRAKE SHOE (P TYPE) MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Caliper, Vernier (WP 0294, Table 1, Item 4)
Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)
Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
Rag, Wiping (WP 0293, Table 1, Item 20)
Ring, Retaining
Qty: (4) (WP 0295, Table 1, Item 168)
Solvent, Cleaning Compound

Materials/Parts (cont.)
(WP 0293, Table 1, Item 25)
Spring, Helical
(WP 0295, Table 1, Item 157)

References
WP 0136

Equipment Condition
Hub and drum assembly removed WP 0136
Fail-safe chamber manually caged WP 0017
Semitrailer uncoupled WP 0007

REMOVAL

1. Loosen bolt (Figure 1, Item 2) on spider (Figure 1, Item 1).

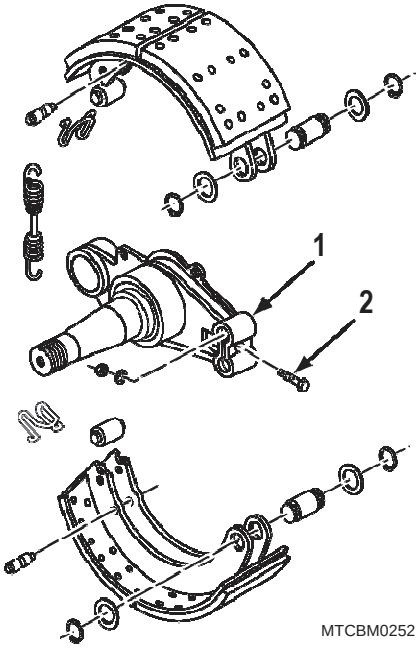


Figure 1. Brake Shoe Removal.

REMOVAL - Continued

WARNING

Use care when removing springs. Springs are under tension and can act as projectiles when released and cause severe eye injury. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

2. Remove brake shoe return spring (Figure 2, Item 12) from two spring pins (Figure 2, Item 8). Discard spring (Figure 2, Item 12).
3. Remove four anchor pin retaining rings (Figure 2, Item 2) and anchor pin washers (Figure 2, Item 3) from two anchor pins (Figure 2, Item 4). Discard retaining rings (Figure 2, Item 2).
4. Drive anchor pins (Figure 2, Item 4) from rear of each brake shoe (Figure 2, Item 1) and remove brake shoes (Figure 2, Item 1).
5. Remove roller retainer (Figure 2, Item 10) and roller (Figure 2, Item 9) from each brake shoe (Figure 2, Item 1).
6. Remove spring pin (Figure 2, Item 8) from each brake shoe (Figure 2, Item 1).

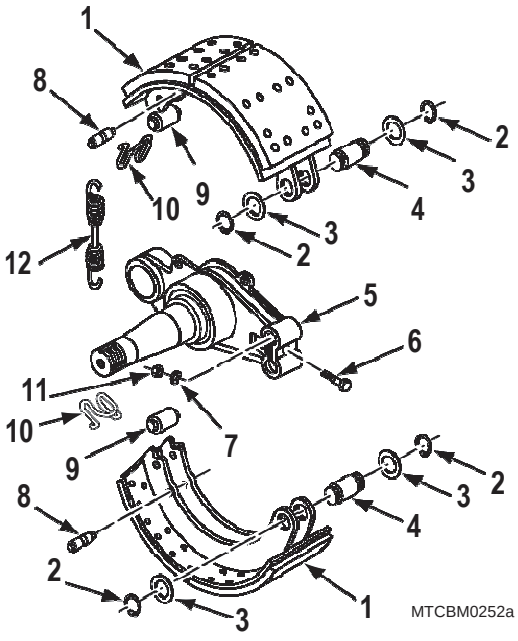


Figure 2. Brake Shoe Replacement.

NOTE

If your spider is equipped with nut and bolt to hold spring pins in place, perform Step 7.

REMOVAL - Continued

7. Remove nut (Figure 2, Item 11), washer (Figure 2, Item 7), and bolt (Figure 2, Item 6) from spider (Figure 2, Item 5).

END OF TASK

CLEANING AND INSPECTION

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Clean anchor pins, rollers, roller retainers and spring pins with solvent.
2. Inspect all parts for damage. Replace any damaged parts.

CLEANING AND INSPECTION - Continued

3. Inspect brake linings for damage and wear. Replace brake shoe if lining is damaged or is worn within 1.30 in. (0.76 mm) of rivet heads.

END OF TASK

REPAIR

NOTE

- Record lining wear between scheduled annual brake maintenance periods to calculate expected wear.
- Shoes with lining that will not last until the next scheduled maintenance interval should be replaced.
- New brake lining has approximately 1/2 in. (12.7 mm) of stock above center rivets and approximately 1/4 in. (6.35 mm) of stock above end rivets.

If drums need refacing, replace drum (WP 0136).

END OF TASK

INSTALLATION

NOTE

If your spider is equipped with nut and bolt to hold spring pins in place, perform Steps 1 and 6.

1. Install bolt (Figure 3, Item 6), washer (Figure 3, Item 7), and nut (Figure 3, Item 8) on spider (Figure 3, Item 5). Do not torque bolt (Figure 3, Item 6).
2. Install spring pin (Figure 3, Item 9) on each brake shoe (Figure 3, Item 1).
3. Install roller (Figure 3, Item 10) and roller retainer (Figure 3, Item 11) on each brake shoe (Figure 3, Item 1).
4. Install each brake shoe (Figure 3, Item 1) on spider (Figure 3, Item 5) with anchor pin (Figure 3, Item 4), two anchor pin washers (Figure 3, Item 3) and two new retaining rings (Figure 3, Item 2).

WARNING

Use care when installing springs. Springs are under tension and can act as projectiles when released and cause severe eye injury. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

5. Using brake spring pliers, install new brake shoe return spring (Figure 3, Item 12) on two spring pins (Figure 3, Item 9).
6. Torque spider nut (Figure 3, Item 8) and bolt (Figure 3, Item 6) between 100-120 lb ft (135.6-162.7 N·m).

INSTALLATION - Continued

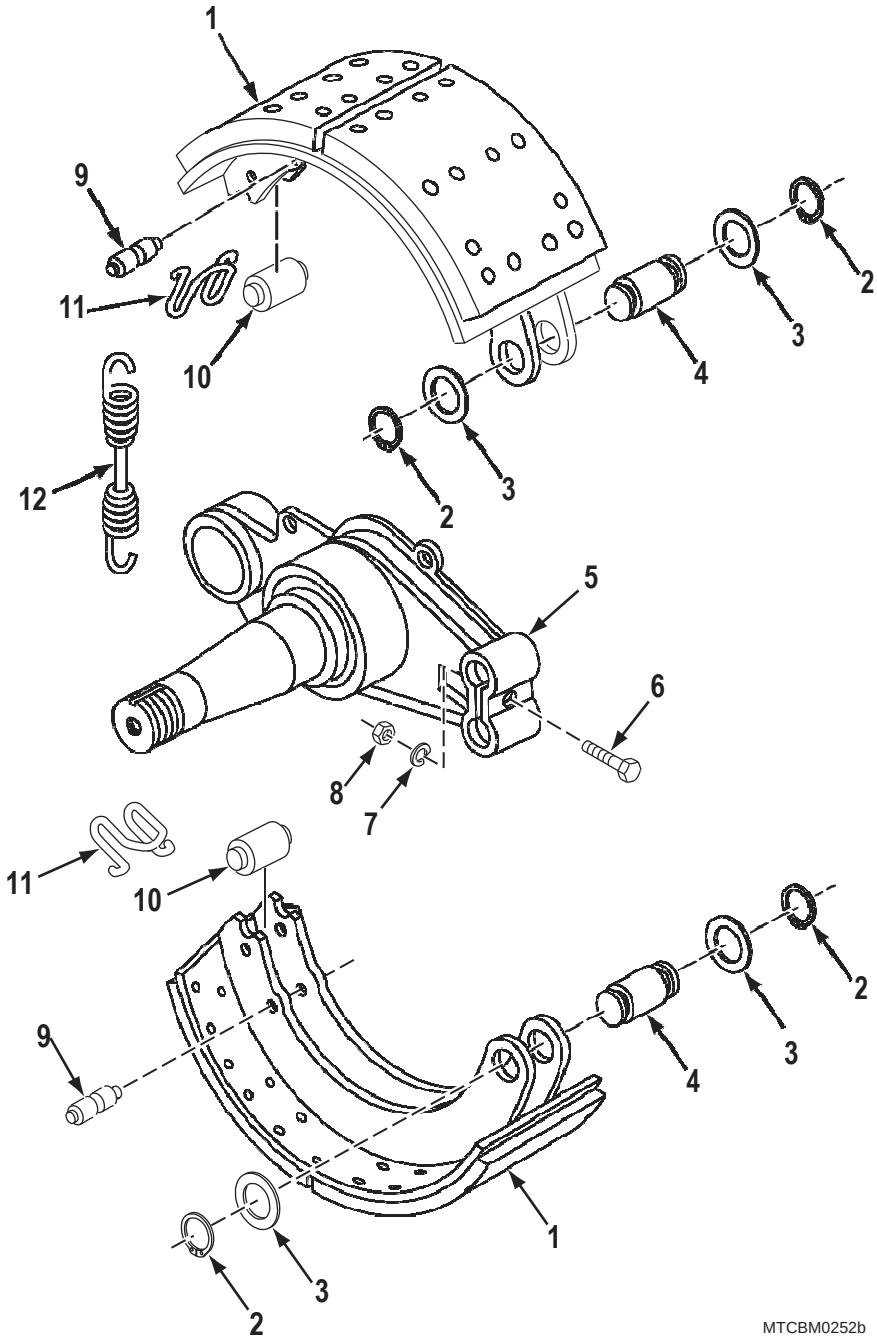


Figure 3. Brake Shoe Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BRAKE SHOE (Q TYPE) MAINTENANCE (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Bushing Removal Tool (WP 0294, Table 1, Item 1)
- Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)
- Pliers, Brake Repair (WP 0294, Table 1, Item 14)

Materials/Parts
- Bushing, Sleeve
  Qty: (4) (WP 0295, Table 1, Item 33)
- Nut, Self-Locking (WP 0295, Table 1, Item 88)
- Pin, Anchor (WP 0295, Table 1, Item 19)
- Rags, Wiping (WP 0293, Table 1, Item 20)
- Retainer, Special
  Qty: (4) (WP 0295, Table 1, Item 108)
- Spring, Helical, Compression
  Qty: (2) (WP 0295, Table 1, Item 55)
- Spring, Helical, Extension
  Qty: (2) (WP 0295, Table 1, Item 54)
- Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)

Personnel Required
Two

References
WP 0123

Equipment Condition
- Hub and drum assembly removed (WP 0136)
- Fail-safe chamber manually caged (WP 0017)
- Semitrailer uncoupled (WP 0007)

WARNING

- Use care when installing springs. Springs are under tension and can act as projectiles when released and cause severe eye injury. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Wear eye protection to prevent eye injury when working with components that could fly through the air. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

When possible, both front and rear axle brakes are replaced as a set. Roadside and curbside brakes are replaced the same way. Rear axle roadside shown.

REMOVAL

1. Disconnect compression spring (Figure 1, Item 9) from upper and lower brake shoes (Figure 1, Items 1 and 11). Discard compression spring (Figure 1, Item 9).
2. Disconnect extension spring (Figure 1, Item 13) from upper and lower brake shoes (Figure 1, Items 1 and 11). Discard extension spring (Figure 1, Item 13).
3. Remove upper and lower brake shoes (Figure 1, Items 1 and 11) from axle spider (Figure 1, Item 12).
4. Remove spring retainers (Figure 1, Item 7), rollers (Figure 1, Item 8), and anchor pins (Figure 1, Item 10) from upper and lower brake shoes (Figure 1, Items 1 and 11). Discard spring retainers (Figure 1, Item 7) and anchor pins (Figure 1, Item 10).
5. Remove four screws (Figure 1, Item 4), two self-locking nuts (Figure 1, Item 5), filler plate (Figure 1, Item 6), and dust cover (Figure 1, Item 3) from axle spider (Figure 1, Item 12). Discard self-locking nuts (Figure 1, Item 5).

NOTE

If rubber plug (Figure 1, Item 2) is missing or damaged, replace.

6. Remove two shoulder pins (Figure 1, Item 15) and sleeves (Figure 1, Item 14) from axle spider (Figure 1, Item 12). Discard sleeves (Figure 1, Item 14).

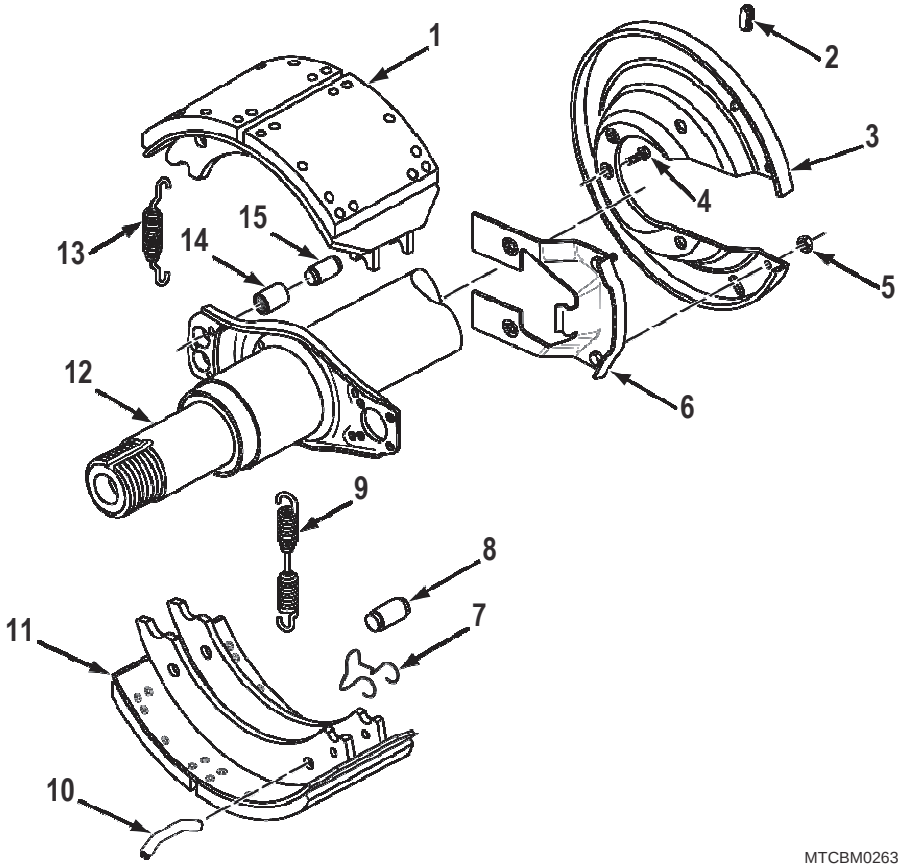


Figure 1. Brake Shoe Removal.

END OF TASK

CLEANING

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Clean sleeves (Figure 1, Item 14) and shoulder pins (Figure 1, Item 15) with solvent. Inspect for damage. Replace if damaged.

CLEANING - Continued

2. Remove two rubber plugs (Figure 2, Item 5), from protective cap (Figure 2, Item 4). Clean rubber plugs with clean dry rags and inspect for damage. Reinstall rubber plugs (Figure 2, Item 5) and/or replace if damaged.

END OF TASK

INSPECTION

1. Inspect brake shoe linings (Figure 2, Item 1) for damage and wear. Replace brake shoe (Figure 2, Item 3) if lining is damaged.

NOTE

New brake linings have approximately 0.50 in. (1.27 cm) of lining above center rivets and approximately 0.25 in. (0.635 cm) of lining above end rivets.

2. Inspect brake shoe (Figure 2, Item 3) lining wear by measuring between center rivets (Figure 2, Item 2) and lining surface (Figure 2, Item 3). Measurement should not be less then 0.030 in. (0.076 cm) from center rivet head to lining surface.
3. If brake shoes (Figure 2, Item 3) are usable, record lining wear and compare to measured readings from previous scheduled maintenance periods to calculate expected wear. If brake shoe linings (Figure 2, Item 1) will not last until the next scheduled maintenance interval, brake shoes (Figure 2, Item 3) should be replaced.
4. Inspect brake drum (Figure 2, Item 6) for cracks, uneven surface or damage. Replace brake drum if cracked or damaged.

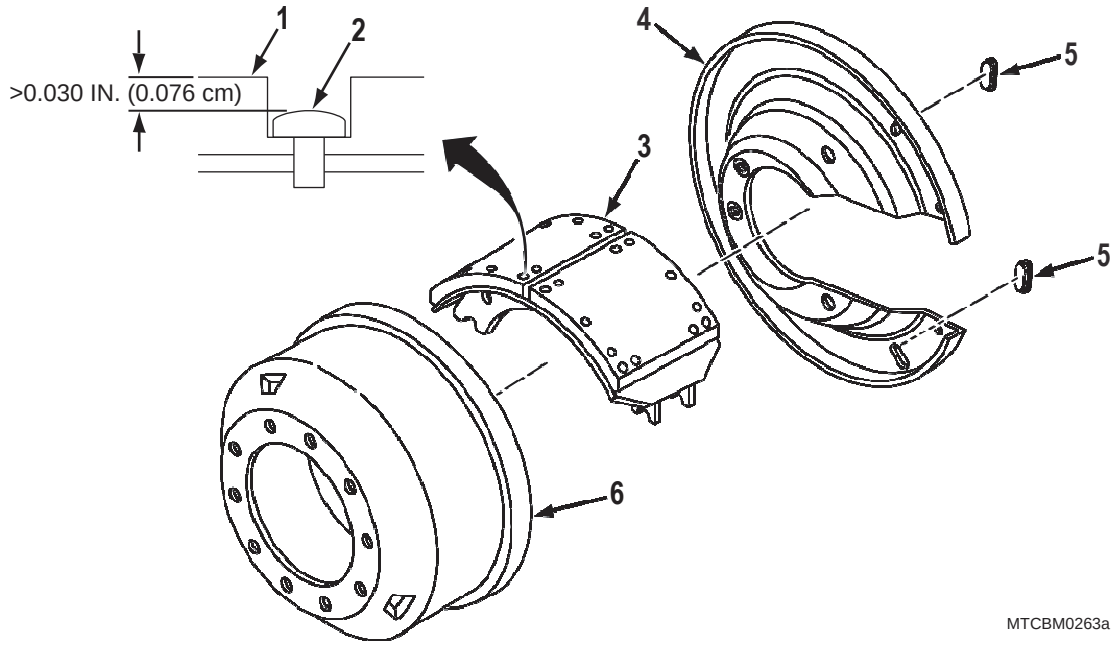


Figure 2. Brake Shoe Lining and Brake Drum Cleaning and Inspection.

END OF TASK

INSTALLATION

1. Install two new sleeves (Figure 3, Item 13) and new shoulder pins (Figure 3, Item 14) to axle spider (Figure 3, Item 11).
2. Position dust cover (Figure 3, Item 2) and filler plate (Figure 3, Item 5) to axle spider (Figure 3, Item 11) and install with four screws (Figure 3, Item 3) and two new self-locking nuts (Figure 3, Item 4).
3. Install roller (Figure 3, Item 7) new spring retainers (Figure 3, Item 6) and new anchor pins (Figure 3, Item 9) to upper (Figure 3, Item 1) and lower brake shoe (Figure 3, Item 10).

WARNING

Use care when installing springs. Springs are under tension and can act as projectiles when released and cause severe eye injury. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

4. With assistance of helper, position upper (Figure 3, Item 1) and lower brake shoes (Figure 3, Item 10) to shoulder pins (Figure 3, Item 14), and S-cam (Figure 3, Item 13) one axle spider (Figure 3, Item 11) and install new extension spring (Figure 3, Item 12).
5. Install new compression spring (Figure 3, Item 8) to upper brake shoe (Figure 3, Item 1) and lower brake shoe (Figure 3, Item 10).

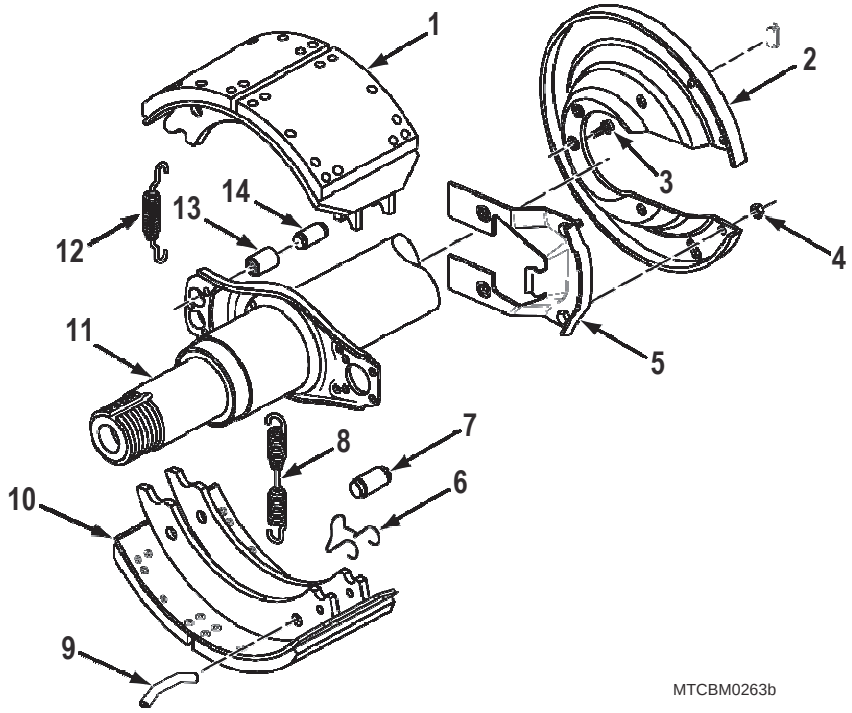


Figure 3. Brake Shoe Installation.

END OF TASK

FOLLOW ON TASK

1. Install hub and drum assembly (WP 0136).
2. Uncage fail-safe chamber (WP 0017).
3. Perform slack adjustment (WP 0123).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
SLACK ADJUSTER (P TYPE) MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Brush, Stiff Fiber (WP 0293, Table 1, Item 2)
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)
Pliers, Locking Ring
(WP 0294, Table 1, Item 15)

Materials/Parts
Pin, Cotter (WP 0295, Table 1, Item 181)
Solvent, Cleaning Compound
(WP 0293, Table 1, Item 25)

References
WP 0017

References (cont.)
WP 0136
WP 0286

Equipment Condition
Semitrailer uncoupled (WP 0007)
Hub and brake drum assembly removed
(WP 0135)
Failsafe chamber manually caged (WP 0017)

REMOVAL

1. Remove cotter pin (Figure 1, Item 1), clevis pin (Figure 1, Item 3), and yoke (Figure 1, Item 2) from slack adjuster (Figure 1, Item 7). Discard cotter pin (Figure 1, Item 1).
2. Remove retaining ring (Figure 1, Item 5) from recess (Figure 1, Item 4) on end of camshaft (Figure 1, Item 6).
3. Using brass hammer, tap on slack adjuster (Figure 1, Item 7) lightly until it can be removed from camshaft (Figure 1, Item 6).

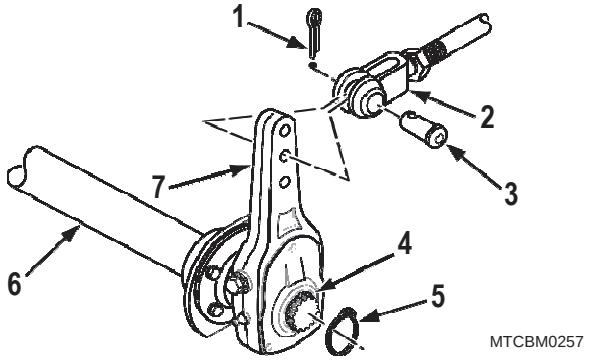


Figure 1. Slack Adjuster Removal.

END OF TASK

CLEANING AND INSPECTION

WARNING

- Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible; DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Clean slack adjuster (Figure 2, Item 9), camshaft splines (Figure 2, Item 6), and other metal parts using solvent and stiff fiber brush. Completely dry parts.
2. Inspect slack adjuster (Figure 2, Item 9) for external damage. Replace if damaged.

CLEANING AND INSPECTION - Continued

3. Inspect worm shaft (Figure 2, Item 7) for stiffness or binding. Repair or replace if necessary.

END OF TASK

INSTALLATION

1. Install slack adjuster (Figure 2, Item 9) on camshaft (Figure 2, Item 8). Use brass hammer to lightly tap slack adjuster (Figure 2, Item 9) into place.
2. Install retaining ring (Figure 2, Item 5) in recess (Figure 2, Item 4) on camshaft (Figure 2, Item 8).
3. Position yoke (Figure 2, Item 2) on slack adjuster (Figure 2, Item 9) and install clevis pin (Figure 2, Item 3) and cotter pin (Figure 2, Item 1).

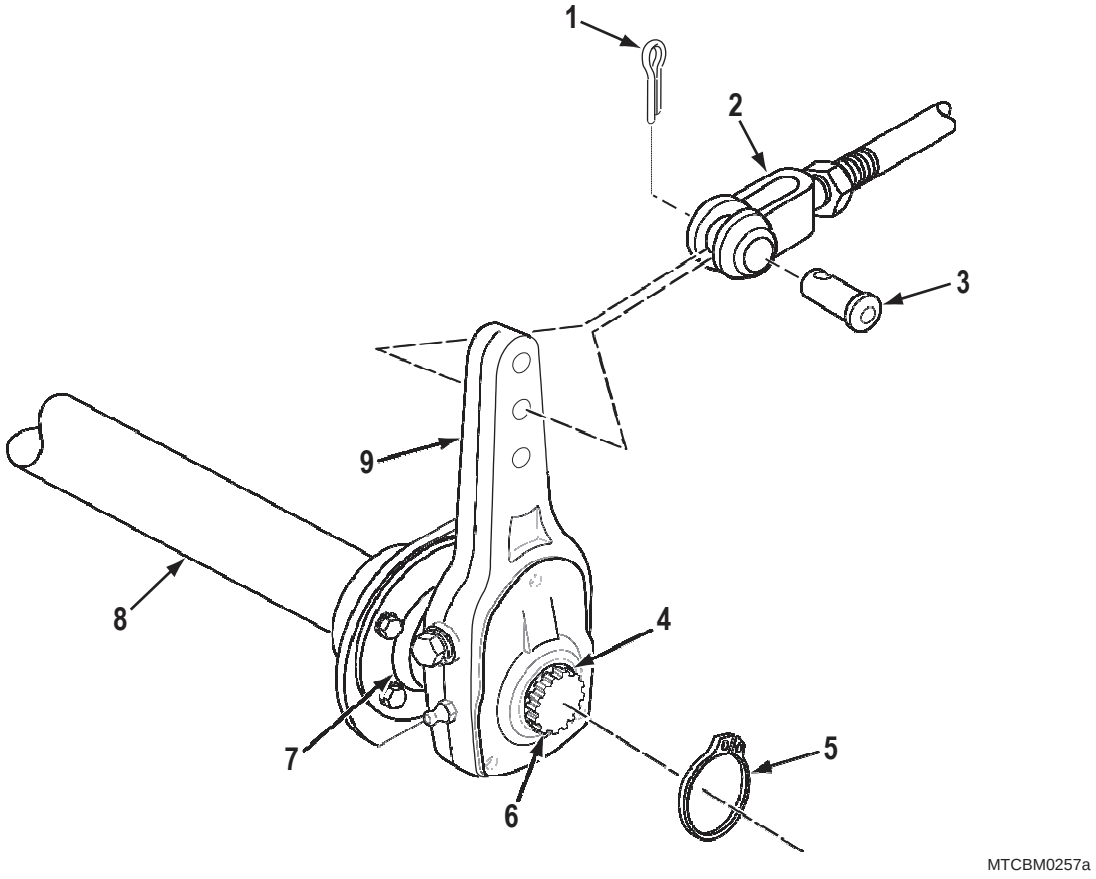


Figure 2. Slack Adjuster Installation.

END OF TASK

ADJUSTMENT

1. Install wheel and drum assembly (WP 0136).
2. Uncage fail-safe chamber (WP 0017).
3. Apply air to air brake chamber (Figure 3, Item 1).
4. Check that wheels rotate freely.
5. Check yoke (Figure 3, Item 2) adjustment.

NOTE

Dimension from outside of non pressure housing to center of clevis pin must be 5.56 in. (14.12 cm).

6. Turn worm shaft hex head (Figure 3, Item 4) clockwise on slack adjuster (Figure 3, Item 3) until wheels cannot be turned.
7. Back off worm shaft hex head (Figure 3, Item 4) until wheel turns freely.
8. Repeat Steps 4 through 7 for all four brake assemblies.

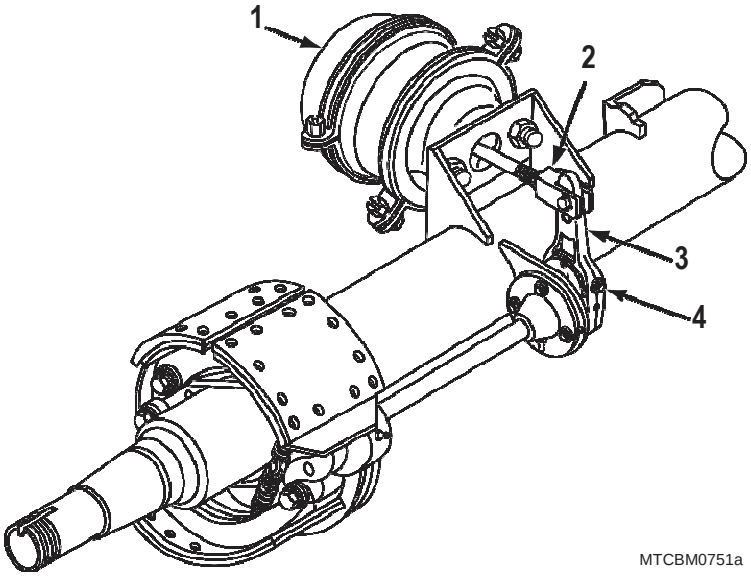


Figure 3. Brake Assembly Adjustment.

END OF TASK

FOLLOW ON TASK

Lubricate slack adjuster (WP 0286).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
SLACK ADJUSTER (Q TYPE) MAINTENANCE (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
- Brush, Stiff Fiber (WP 0293, Table 1, Item 2)
- Grease, Automotive and Artillery (WP 0293, Table 1, Item 13)
- Pin, Cotter (WP 0295, Table 1, Item 150)
- Pin, Cotter (WP 0295, Table 1, Item 151)

Materials/Parts (cont.)
- Rag, Wiping (WP 0293, Table 1, Item 20)
- Ring, Retaining
  - Qty: (4) (WP 0295, Table 1, Item 39)

References
- TM 9-2330-339-23P
- WP 0286

Equipment Condition
- Semitrailer disconnected (WP 0007)
- Semitrailer grounded (WP 0008)
- Air reservoir drained (WP 0082)

NOTE

There are four slack adjusters. This procedure replaces one slack adjuster. The slack adjusters are replaced the same way.

DISASSEMBLY

1. Rotate slack adjuster manual adjustment hex (Figure 1, Item 14) counterclockwise until slack adjuster (Figure 1, Item 11) is clear of brake actuator push rod (Figure 1, Item 6).

NOTE

More torque is required to rotate slack adjuster manual adjustment hex counterclockwise than is necessary to rotate is clockwise. Torque may be as high as 70 lb ft (94.9 N·m)

2. Loosen brake actuator push rod jamnut (Figure 1, Item 5). Loosen yoke adaptor (Figure 1, Item 4) until it is free of yoke (Figure 1, Item 3).
3. Remove retaining ring (Figure 1, Item 13) from recess on end of camshaft (Figure 1, Item 12). Discard retaining ring (Figure 1, Item 13).
4. Tap on slack adjuster (Figure 1, Item 11) lightly until it can be removed from camshaft (Figure 1, Item 12).
5. Remove two cotter pins (Figure 1, Items 1 and 2), yoke pin (Figure 1, Item 8), link pin (Figure 1, Item 9), two washers (Figure 1, Items 7 and 10), and yoke (Figure 1, Item 3) from slack adjuster (Figure 1, Item 11). Discard cotter pins (Figure 1, Items 1 and 2).

END OF TASK

CLEANING AND INSPECTION

WARNING

Wear eye protection to prevent eye injury when working with components that could fly through the air. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

DO NOT use solvents or soap and water for cleaning. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Clean slack adjuster, splines of camshaft, and other metal parts using stiff fiber brush, and wipe clean.
2. Inspect slack adjuster for bent, broken, loose, or misaligned brake actuator push rods and cracked or damaged brake actuator brackets. Replace slack adjuster if damaged.

END OF TASK

ASSEMBLY

NOTE

Put light coat of grease on spline before installing slack adjuster.

1. Install yoke (Figure 1, Item 3), yoke pin (Figure 1, Item 8), link pin (Figure 1, Item 9), two washers (Figure 1, Items 7 and 10), and new cotter pins (Figure 1, Items 1 and 2) on slack adjuster (Figure 1, Item 11).
2. Install slack adjuster (Figure 1, Item 11) and new retaining ring (Figure 1, Item 13) on end of camshaft (Figure 1, Item 12).

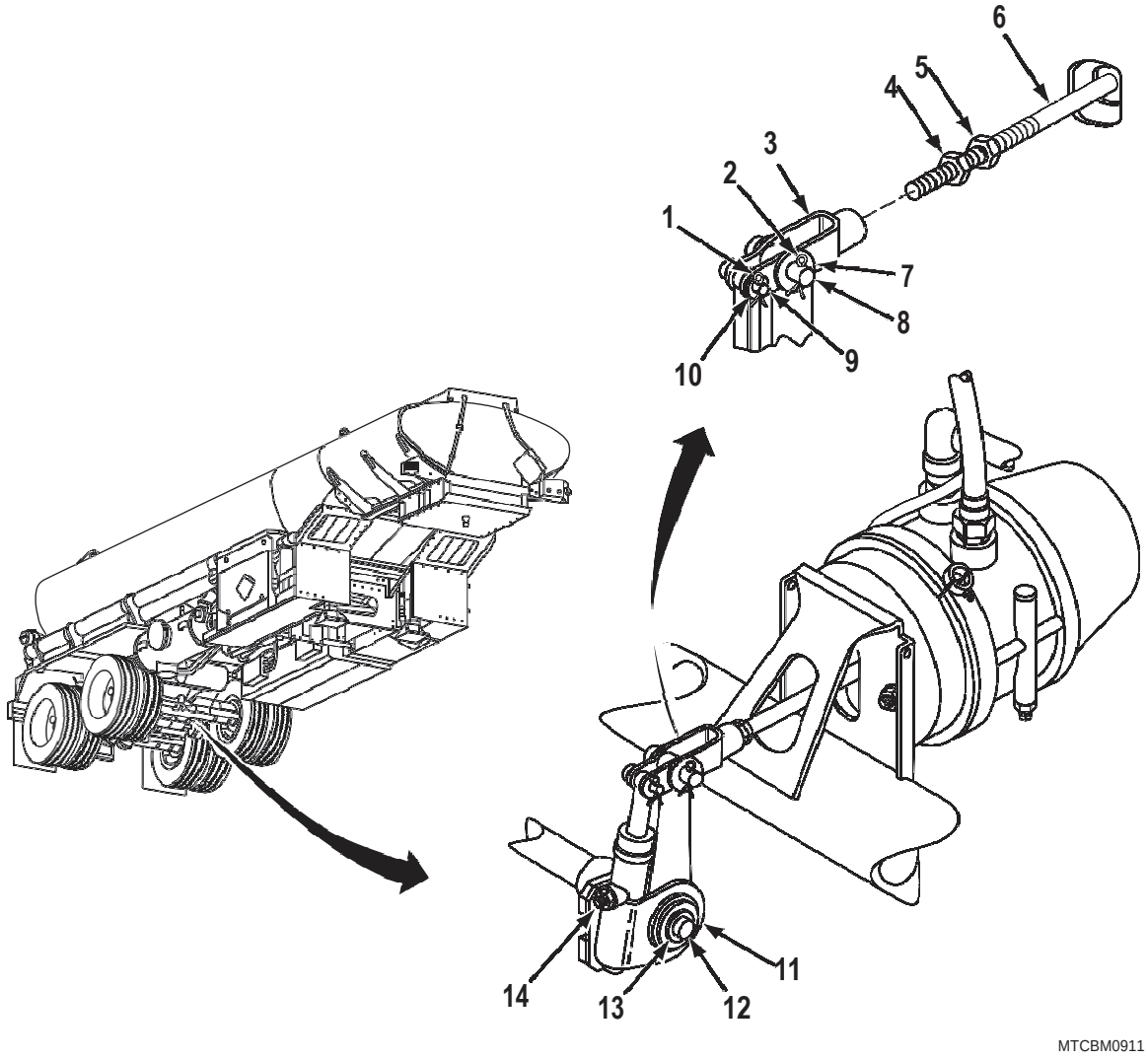


Figure 1. Slack Adjuster Maintenance.

ASSEMBLY - Continued

3. Install jamnut (Figure 2, Item 3) approximately 1-5/16 in. (3.33 cm) from end of push rod (Figure 2, Item 2).
4. Install yoke adapter (Figure 2, Item 4) on push rod (Figure 2, Item 2) approximately 3/8 in. (9.5 mm) from end of push rod (Figure 2, Item 2).
5. Turn manual adjustment hex (Figure 2, Item 5) clockwise until yoke adapter (Figure 2, Item 4) extends into bore of yoke (Figure 2, Item 1) approximately 1/8 in. (3.2 mm). Thread adapter into yoke and torque to 10 lb ft (13.6 N·m).
6. Torque jamnut (Figure 2, Item 3) to 34 to 50 lb ft (46.0 to 67.8 N·m).
7. Lubricate camshaft (WP 0286).

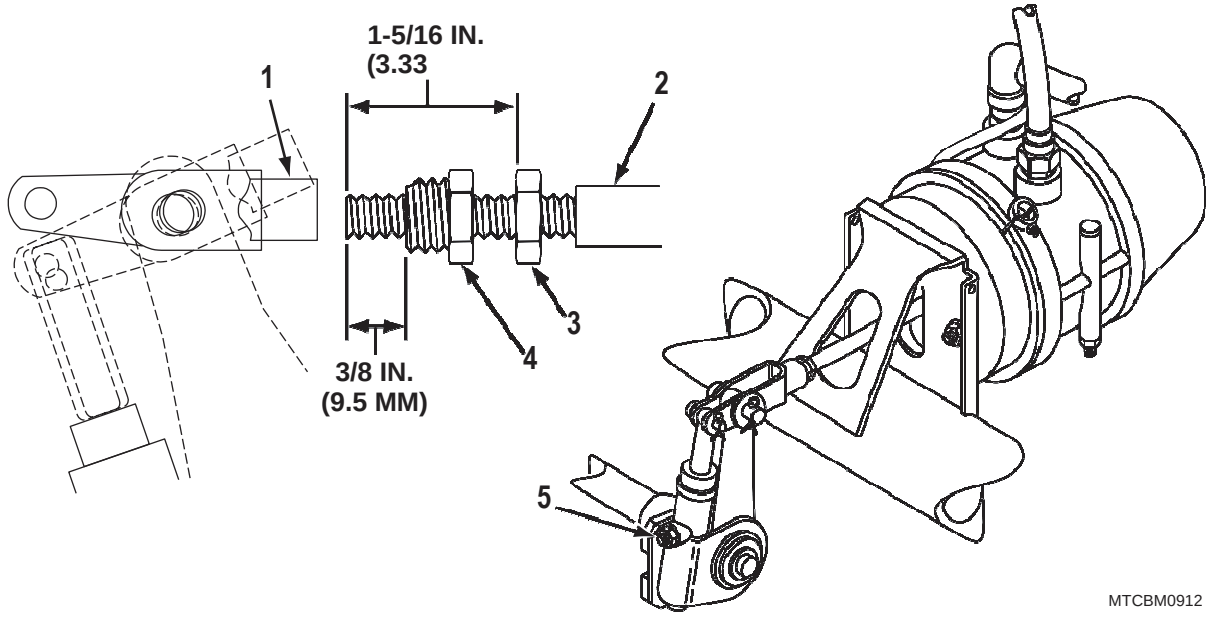


Figure 2. Slack Adjusters/Yoke Adapter.

END OF TASK

ADJUSTMENT

1. Raise rear axle until wheels clear ground. Rotate manual adjustment hex (Figure 3, Item 3) clockwise until brake linings are snug against brake drum.

NOTE

More torque is required to rotate manual adjustment hex counterclockwise than is necessary to rotate is clockwise. Torque may be as high as 70 lb ft (94.9 N·m)

2. Turn manual adjustment hex (Figure 3, Item 3) counterclockwise 1/4 turn. Pull push rod (Figure 3, Item 1) to confirm that push rod (Figure 3, Item 2) has approximately 0.50 in. (12.7 mm) of free travel.
3. Apply 90 to 95 psi (625 to 655 kPa) air pressure from Prime Mover air gage. Make and hold a full brake application. Measure push rod stroke. Maximum stroke is 2 in. (5.1 cm). If stroke exceeds 2 in. (5.1 cm) limit, inspect all brake system components for serviceability.

ADJUSTMENT - Continued

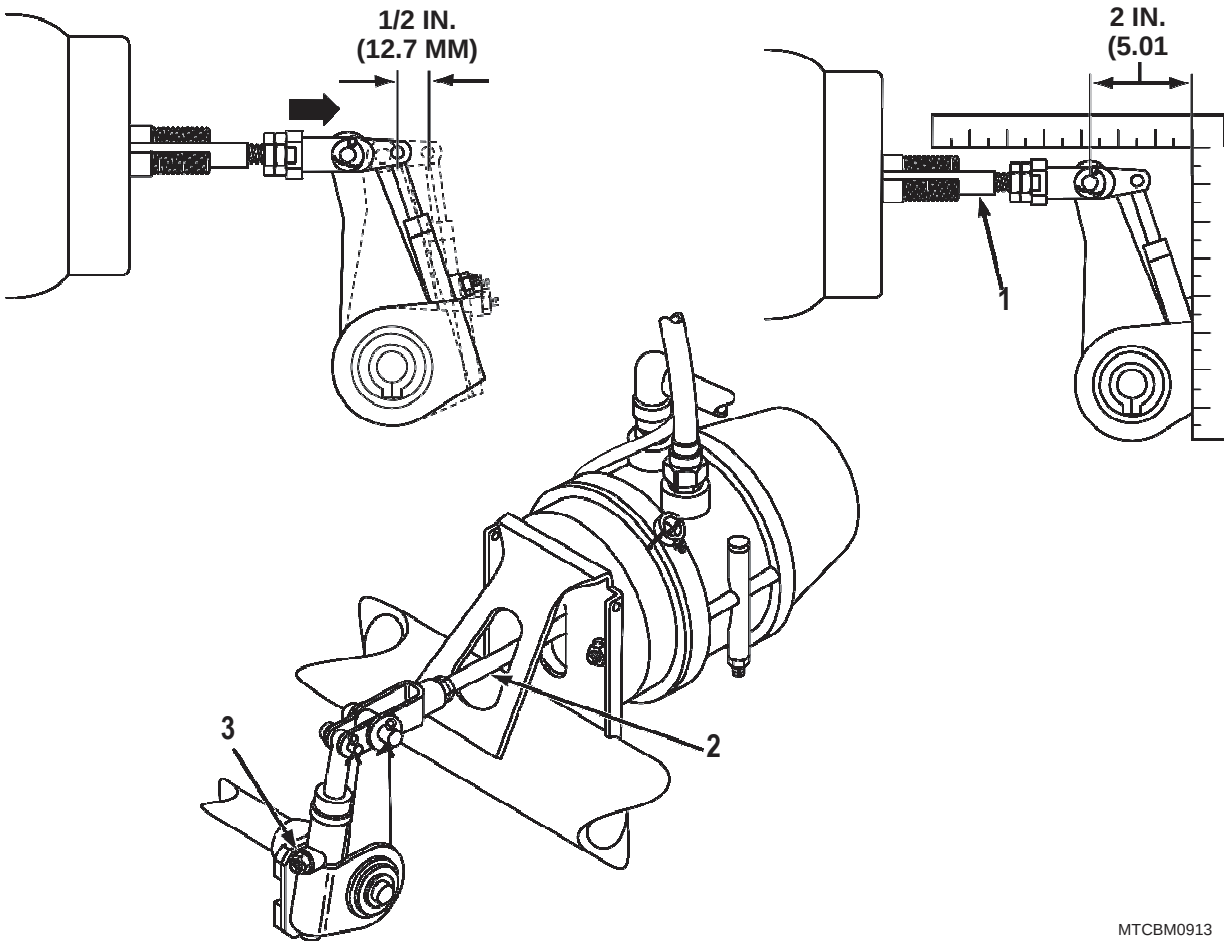


Figure 3. Slack Adjusters Push Rod.

END OF TASK

FOLLOW ON TASK

Disconnect semitrailer grounding cables (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AIR BRAKE CHAMBER (P TYPE) MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Pin, Cotter (WP 0295, Table 1, Item 181)
Soap (WP 0293, Table 1, Item 23)
Tape, Antiseize (WP 0293, Table 1, Item 29)
Washer, Lock

Materials/Parts (cont.)
Qty: (2) (WP 0295, Table 1, Item 197)

References
WP 0086

Equipment Condition
Air reservoir drain valves opened (WP 0082)
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Disconnect two brake air hoses (Figure 1, Item 1) from air brake chamber (Figure 1, Item 2).
2. Remove cotter pin (Figure 1, Item 3), clevis pin (Figure 1, Item 9), and yoke (Figure 1, Item 8) from slack adjuster (Figure 1, Item 6). Discard cotter pin (Figure 1, Item 3).
3. Remove two nuts (Figure 1, Item 5), two lockwashers (Figure 1, Item 4), and air brake chamber (Figure 1, Item 2) from bracket (Figure 1, Item 7). Discard lockwashers (Figure 1, Item 4).

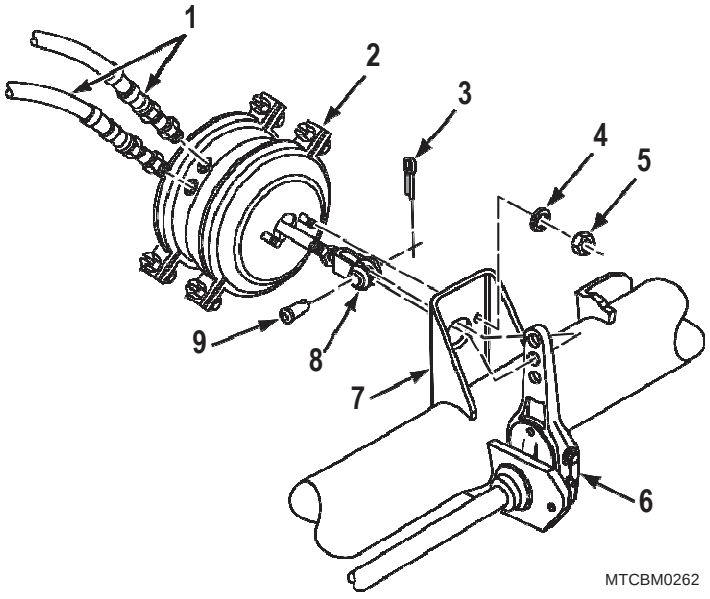


Figure 1. Air Brake Chamber Removal.

END OF TASK

INSTALLATION

1. Install brake air chamber (Figure 2, Item 2) on bracket (Figure 2, Item 6) with two nuts (Figure 2, Item 5) and new lockwashers (Figure 2, Item 4).
2. Install yoke (Figure 2, Item 8), cotter pin (Figure 2, Item 3), and clevis pin (Figure 2, Item 9) on slack adjuster (Figure 2, Item 6).
3. Connect two brake air hoses (Figure 2, Item 1) to air brake chamber (Figure 2, Item 2).
4. Pressurize air brake system and check for leaks. Refer to (WP 0086).

END OF TASK

TEST

NOTE

Initial brake application will force out a small amount of air. No air should be expelled from air brake chamber after initial application. If air continues to be expelled from air brake chamber, replace air chamber.

1. With Prime Mover connected and semitrailer brakes applied, coat flanges (Figure 2, Item 10) and brake air hoses (Figure 2, Item 11) on air brake chamber (Figure 2, Item 2) with soapy water.
2. Inspect flange (Figure 2, Item 10) and brake air hoses (Figure 2, Item 11) for leakage indicated by bubbles.
3. If leakage is found at flange (Figure 2, Item 10), replace air brake chamber (Figure 2, Item 2).
4. If leakage is found at brake air hoses (Figure 2, Item 11), tighten fittings.

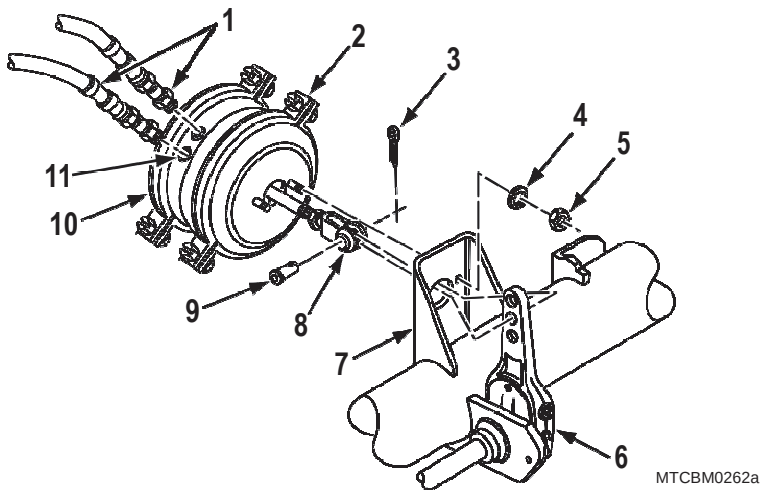


Figure 2. Air Brake Chamber Test.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AIR BRAKE CHAMBER (Q TYPE) MAINTENANCE (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Pin, Cotter (WP 0295, Table 1, Item 150)
Pin, Cotter (WP 0295, Table 1, Item 151)
Soap (WP 0293, Table 1, Item 23)

Personnel Required
Two

References
WP 0086

Equipment Condition
Semitrailer uncoupled (WP 0007)
Air reservoir drain valves opened (WP 0082)

WARNING

Wear eye protection to prevent eye injury when working with components that could fly through the air. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Air brake chambers are located on each wheel station. All air brake chambers are removed the same way. Roadside rear air brake chamber shown.

REMOVAL

1. Disconnect two brake air hoses (Figure 1, Items 10 and 11) from air brake chamber (Figure 1, Item 9).

NOTE

Count number of threads on air brake chamber push rod to jamnut, for ease of installation.

2. Loosen brake actuator push rod jamnut (Figure 1, Item 7) on air brake chamber push rod (Figure 1, Item 8).
3. Remove cotter pins (Figure 1, Items 3 and 4) and straight headed pins (Figure 1, Items 13 and 14) from yoke (Figure 1, Item 5). Discard cotter pins (Figure 1, Items 3 and 4).
4. Loosen yoke adapter (Figure 1, Item 6) on air brake chamber push rod (Figure 1, Item 8).
5. Disconnect yoke (Figure 1, Item 5) from slack adjuster (Figure 1, Item 16) and remove yoke from air brake chamber push rod (Figure 1, Item 8).
6. Remove two nuts (Figure 1, Item 1), washers (Figure 1, Item 2), and air brake chamber (Figure 1, Item 9) from axle (Figure 1, Item 15).

END OF TASK

INSTALLATION

1. Position air brake chamber (Figure 1, Item 9) to axle (Figure 1, Item 15) and install with two washers (Figure 1, Item 2) and nuts (Figure 1, Item 1).
2. Install yoke (Figure 1, Item 5) to air brake chamber push rod (Figure 1, Item 8) and tighten yoke adapter (Figure 1, Item 6) and jamnut (Figure 1, Item 7) to same position as previously noted.
3. Position yoke (Figure 1, Item 5) to slack adjuster (Figure 1, Item 16) and install straight headed pins (Figure 1, Items 13 and 14) and new cotter pins (Figure 1, Items 3 and 4).
4. Install two brake air hoses (Figure 1, Items 10 and 11) to air brake chamber (Figure 1, Item 9) as previously noted.

END OF TASK

TEST

NOTE

Initial brake application will force out a small amount of air. No air should be expelled from air brake chamber after initial application. If air continues to be expelled from air brake chamber, replace air chamber.

1. With Prime Mover connected and semitrailer brakes applied, coat flanges (Figure 2, Item 12) and brake air hoses (Figure 2, Items 10 and 11) on air brake chamber (Figure 2, Item 9) with soapy water.
2. Inspect flange (Figure 2, Item 12) and brake air hoses (Figure 2, Items 10 and 11) for leakage indicated by bubbles.
3. If leakage is found at flange (Figure 2, Item 12), replace air brake chamber (Figure 2, Item 9).
4. If leakage is found at brake air hoses (Figure 2, Items 10 and 11), tighten fittings.

TEST - Continued

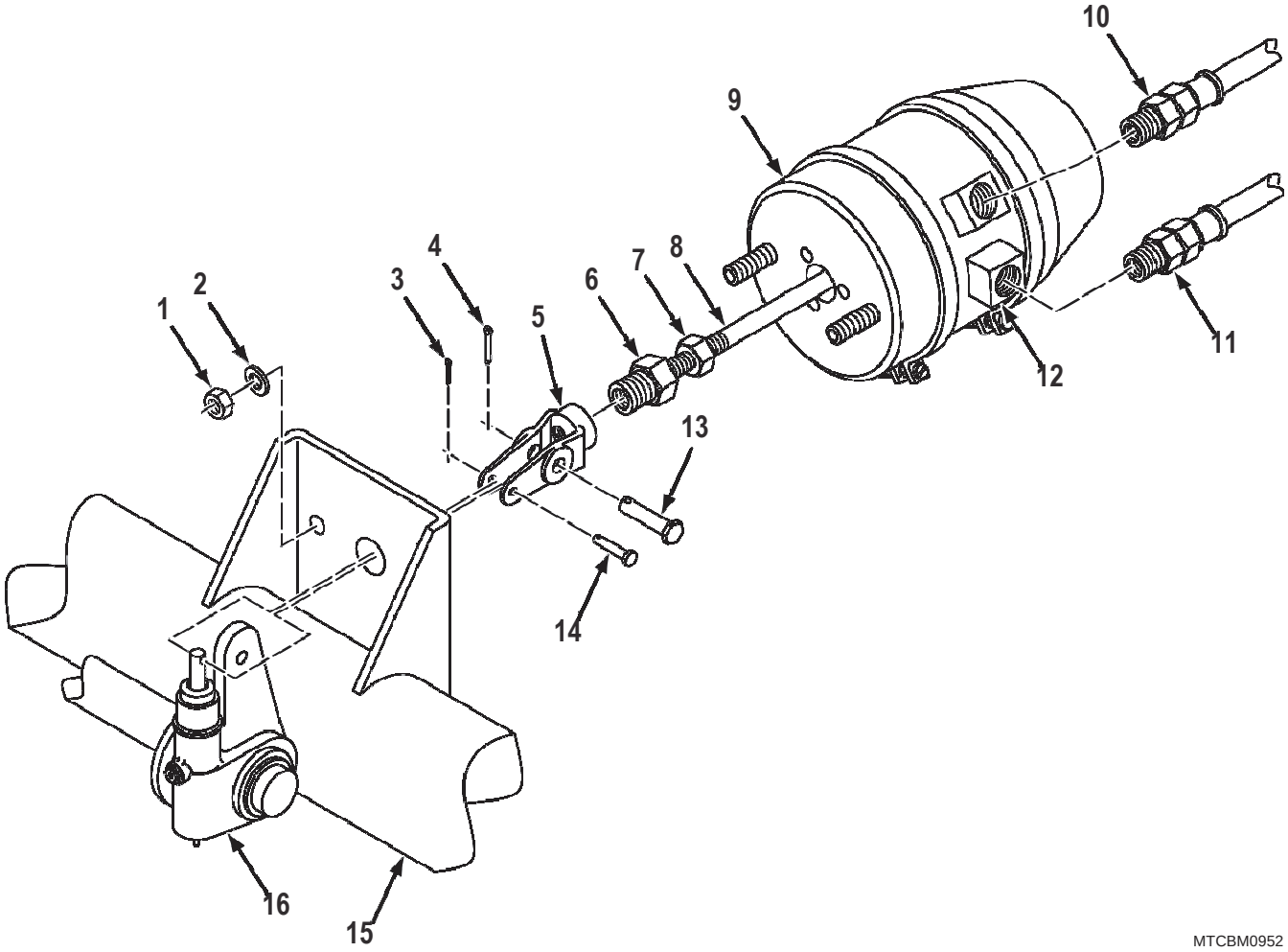


Figure 1. Air Brake Chamber 'Q' Type Maintenance.

END OF TASK

FOLLOW ON TASK

1. Close air reservoir drain valves (WP 0082).
2. Perform air system leak test (WP 0086).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AIR RESERVOIR AND DRAINCOCK REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 164)

References
WP 0086

Equipment Condition
Air reservoir drain valves opened (WP 0082)
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Remove air drain valve (Figure 1, Item 4) from air reservoir (Figure 1, Item 8).
2. Disconnect hoses and fittings (Figure 1, Item 6) from relay valve (Figure 1, Item 7) on air reservoir (Figure 1, Item 8).
3. Remove air fittings (Figure 1, Item 5) on the end of air reservoir (Figure 1, Item 8).
4. Remove relay valve (Figure 1, Item 7) from air reservoir (Figure 1, Item 8).
5. Remove four mounting bolts (Figure 1, Item 1), washers (Figure 1, Item 2), and self-locking nuts (Figure 1, Item 3) from air reservoir (Figure 1, Item 8) and remove air reservoir (Figure 1, Item 8) from semitrailer. Discard self-locking nuts (Figure 1, Item 3).

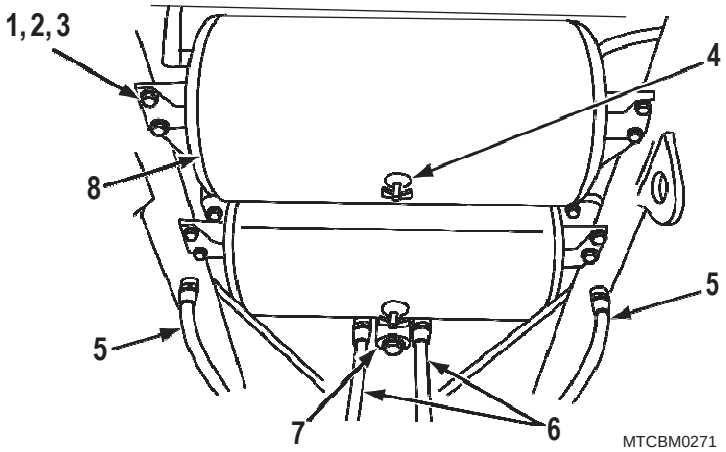


Figure 1. Air Reservoir Removal.

END OF TASK

INSTALLATION

1. Install air reservoir (Figure 2, Item 8) with four mounting bolts (Figure 2, Item 1), washers (Figure 2, Item 2), and new self-locking nuts (Figure 2, Item 3).
2. Install relay valve (Figure 2, Item 7) on air reservoir (Figure 2, Item 8).
3. Install air fittings (Figure 2, Item 6) on relay valve (Figure 2, Item 7) on air reservoir (Figure 2, Item 8).
4. Install hoses (Figure 2, Item 5) on relay valve (Figure 2, Item 7) on rear air reservoir (Figure 2, Item 8).
5. Install air drain valve (Figure 2, Item 4) on air reservoir (Figure 2, Items 8).
6. Check air fittings (Figure 2, Item 5), relay valve (Figure 2, Item 7), and air drain valves (Figure 2, Item 4) for leaks (WP 0086). Tighten fittings if leaks are found.

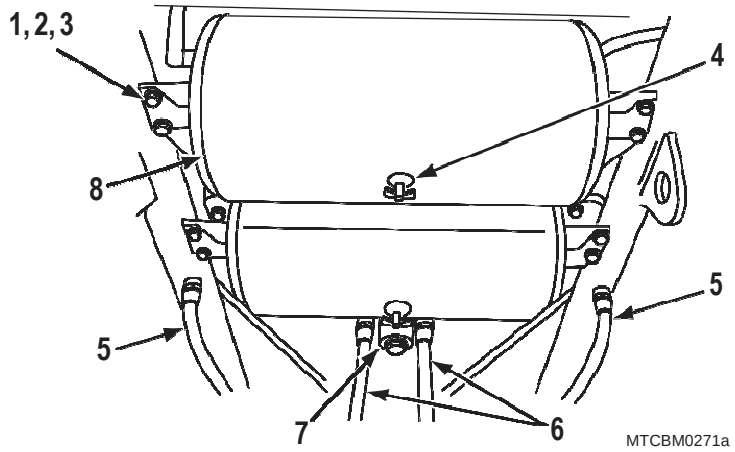


Figure 2. Air Reservoir Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AIR LINE TUBING AND FITTINGS REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0086
WP 0285

Materials/Parts
Soap (WP 0293, Table 1, Item 23)
Tape, Antiseize (WP 0293, Table 1, Item 29)

Equipment Condition
Semitrailer uncoupled (WP 0007)

NOTE

Tag all hoses and connections for ease of installation.

REMOVAL

1. Disconnect air line (Figure 1, Item 4) from fitting (Figure 1, Item 2).
2. Cut end of hose and remove nut (Figure 1, Item 1).
3. Release clips (Figure 1, Item 5) and pull air line tubing (Figure 1, Item 4) through grommets (Figure 1, Item 6).
4. Remove fitting (Figure 1, Item 2) from air reservoir (Figure 1, Item 3).

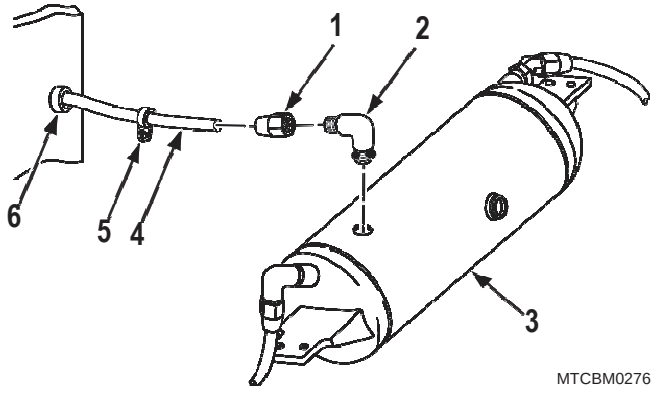


Figure 1. Air Line Tubing and Fitting Removal.

END OF TASK

INSTALLATION

1. Apply antiseize tape to fitting (Figure 2, Item 2) and install fitting on air reservoir.
2. Pull air line (Figure 2, Item 3) through grommets (Figure 2, Item 5) and secure with clips (Figure 2, Item 4).
3. Assemble air line with nut (Figure 2, Item 1) (WP 0285).

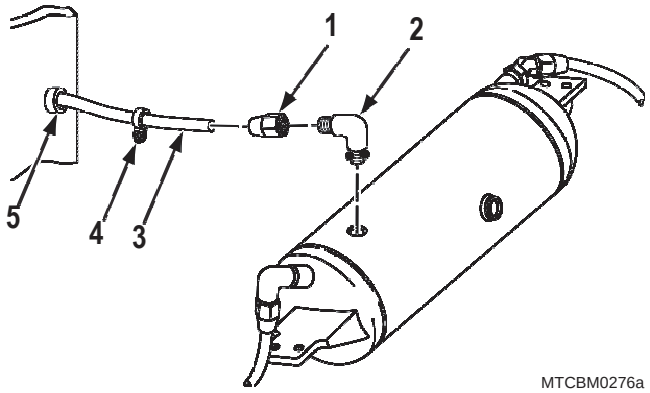


Figure 2. Air Line Tubing and Fitting Replacement.

END OF TASK

FOLLOW ON TASK

Perform leak test on air line (WP 0086).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
SERVICE AND EMERGENCY COUPLINGS PACKING RINGS AND AIR LINES REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0086
WP 0127

Materials/Parts
Compound, Thread Sealing (WP 0293, Table 1)
Packing, Preformed
Qty: (2) (WP 0295, Table 1, Item 45)
S-Hook (WP 0295, Table 1, Item 204)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

NOTE

- There are two gladhands and both are replaced the same way. This procedure replaces the service (blue coded) gladhand.
- It is not necessary to remove gladhand if only replacing packing ring.

1. Remove S-hook (Figure 1, Item 2) from gladhand (Figure 1, Item 3). Discard S-hook (Figure 1, Item 2).
2. Disconnect tube (Figure 1, Item 6) from push-lock fitting (Figure 1, Item 4), refer to (WP 0127) and remove push-lock fitting from gladhand (Figure 1, Item 3) at rear of bulkhead.
3. Remove rear nut (Figure 1, Item 5) from gladhand (Figure 1, Item 3) at rear of bulkhead.
4. Loosen front nut (Figure 1, Item 1) at front of bulkhead if necessary and remove gladhand (Figure 1, Item 3).

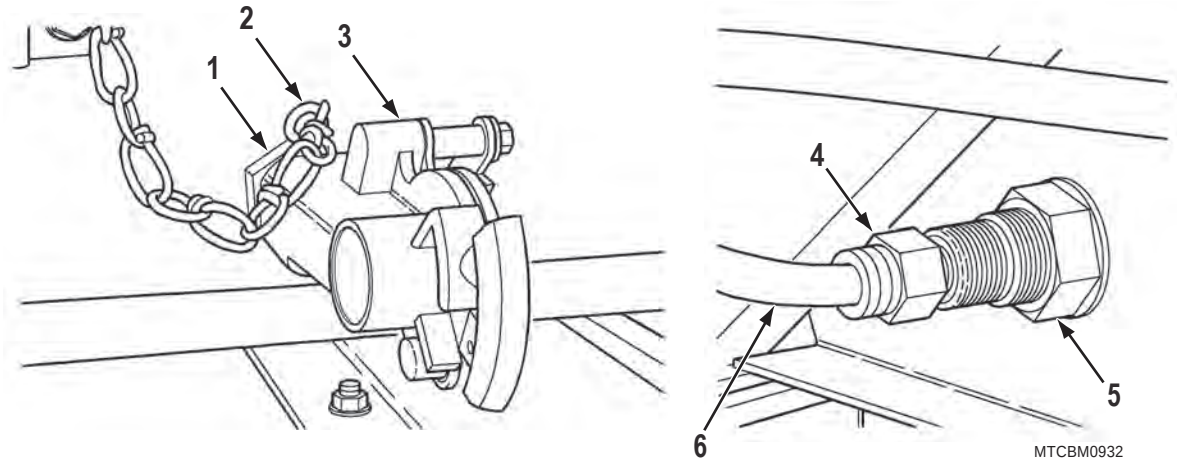


Figure 1. Service and Emergency Couplings (Gladhands) Removal.

END OF TASK

REPAIR

1. Remove packing ring (Figure 2, Item 2) from gladhand (Figure 2, Item 1). Discard packing ring (Figure 2, Item 2).
2. Clean groove in gladhand (Figure 2, Item 1).
3. Install new packing ring (Figure 2, Item 2) into groove of gladhand (Figure 2, Item 1).

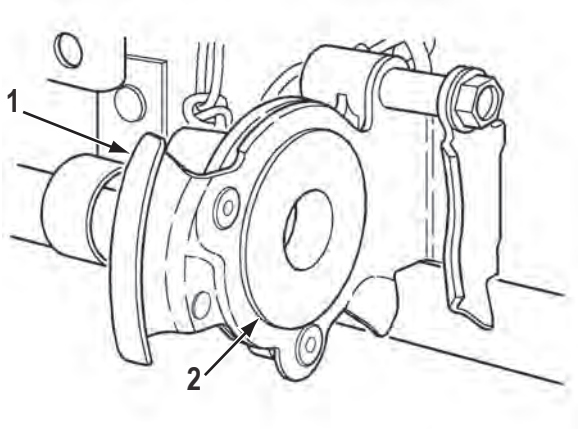


Figure 2. Gladhand Repair.

END OF TASK

INSTALLATION

1. Install gladhand (Figure 3, Item 3) to bulkhead.
2. Install rear nut (Figure 3, Item 5) on threads of gladhand (Figure 3, Item 3) at rear of bulkhead and secure gladhand (Figure 3, Item 3) by tightening front nut (Figure 1, Item 1) and rear nut (Figure 3, Item 5) at the same time on the bulkhead.
3. Install push-lock fitting (Figure 3, Item 4) to gladhand (Figure 3, Item 3) at rear of bulkhead and connect tube (Figure 3, Item 6) to push-lock fitting (Figure 3, Item 4) at bulkhead (WP 0127).
4. Install new S-hook (Figure 3, Item 2) on gladhand (Figure 3, Item 3) at front of bulkhead.

INSTALLATION - Continued

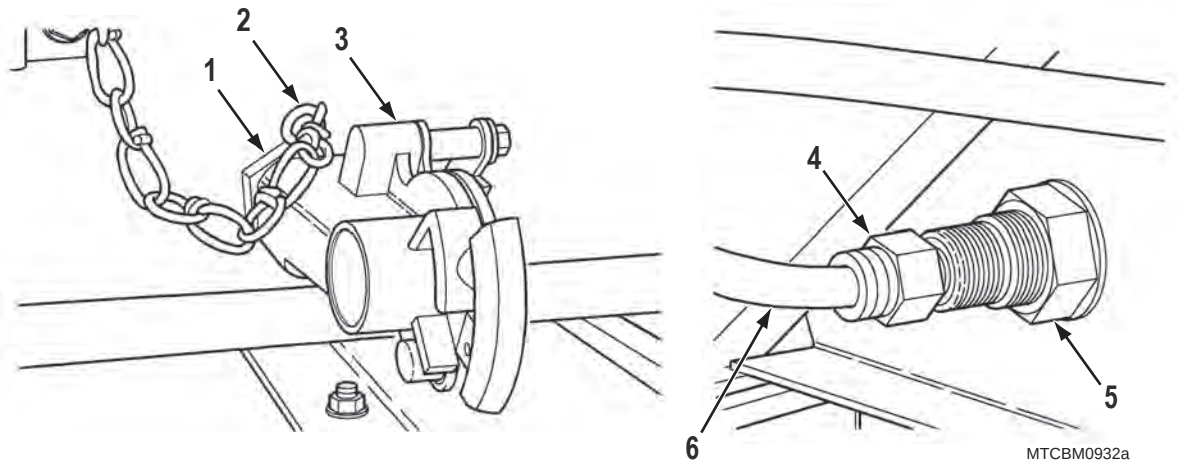


Figure 3. Service and Emergency Couplings (Gladhands) Installation.

END OF TASK

FOLLOW ON TASK

Perform air system leak test (WP 0086).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
SAFETY RELIEF VALVE MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Gage, Test (WP 0294, Table 1, Item 9)

Equipment Condition
Air reservoir drain valves opened (WP 0082)
Semitrailer uncoupled (WP 0007)

Materials/Parts
Tape, Antiseize (WP 0293, Table 1, Item 29)

REMOVAL

1. Remove air line (Figure 1, Item 1) and adapter (Figure 1, Item 2) from end of safety relief valve (Figure 1, Item 3).
2. Remove valve (Figure 1, Item 3) from nipple (Figure 1, Item 7).
3. Remove nipple (Figure 1, Item 7) from elbow (Figure 1, Item 6).
4. Remove elbow (Figure 1, Item 6) and bushing (Figure 1, Item 5) from primary (rear) air reservoir (Figure 1, Item 4).

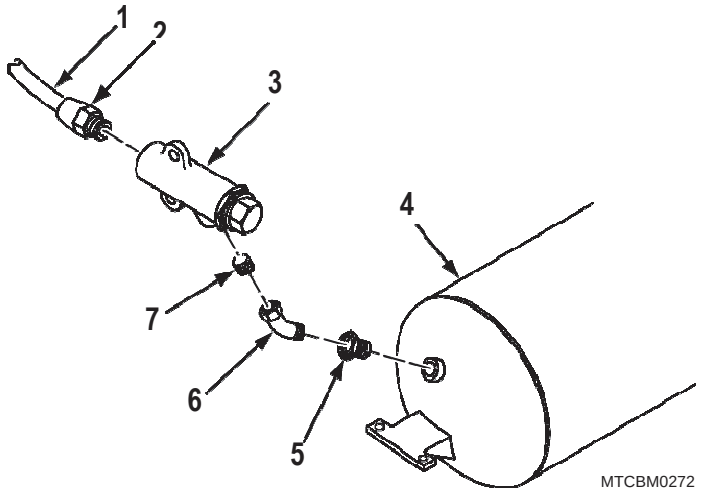


Figure 1. Safety Relief Valve Removal.

END OF TASK

INSTALLATION

1. Install elbow (Figure 2, Item 8) and bushing (Figure 2, Item 7) on primary (rear) air reservoir (Figure 2, Item 6).
2. Apply antiseize tape to threads of nipple (Figure 2, Item 9) and install nipple (Figure 2, Item 9) in elbow (Figure 2, Item 8).
3. Install side port of safety relief valve (Figure 2, Item 3) on nipple (Figure 2, Item 9).
4. Install air line (Figure 2, Item 1) and adapter (Figure 2, Item 2) on safety relief valve (Figure 2, Item 3).

END OF TASK

TEST

1. Attach end of air system test gage to semitrailer EMERGENCY gladhand.

NOTE

Air supply can be either a Prime Mover or a stationary source.

2. Attach air supply line to valve end of test gage.
3. Pressurize system and close valve on test gage when system is full.
4. Note gage reading and drain secondary (forward) air reservoir by opening drain valve on bottom of reservoir. When all air has exhausted from secondary system, gage should read 75 psi (517 kPa). If pressure is not correct, perform Step 5.
5. Loosen locknut (Figure 2, Item 4) at base of cap (Figure 2, Item 5) and turn cap (Figure 2, Item 5) clockwise to increase pressure setting. Turn cap (Figure 2, Item 5) counterclockwise to decrease pressure setting.
6. Repeat Step 5 until desired pressure is obtained, then tighten locknut (Figure 2, Item 4).
7. Remove air system test gage.

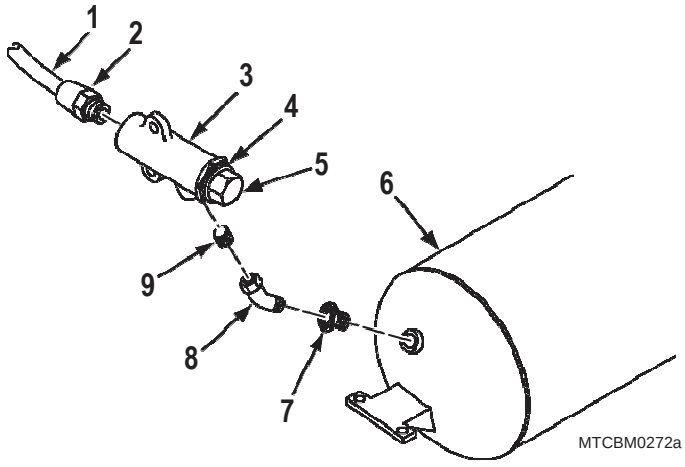


Figure 2. Safety Relief Valve Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
PARKING BRAKE CONTROL VALVE MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition
Air reservoir drain valves opened (WP 0082)
Semitrailer uncoupled (WP 0007)

Materials/Parts
Soap (WP 0293, Table 1, Item 23)
Tape, Antiseize (WP 0293, Table 1, Item 29)

REMOVAL

NOTE

Tag all hoses and lines prior to removal for ease of installation.

1. Disconnect three air lines (Figure 1, Item 1) and fittings (Figure 1, Item 2) from two elbows (Figure 1, Item 3) and adapter (Figure 1, Item 6) on control valve (Figure 1, Item 11).
2. Remove roll pin (Figure 1, Item 8), button (Figure 1, Item 7), and boot (Figure 1, Item 9) from control valve (Figure 1, Item 11).
3. Remove nut (Figure 1, Item 10) on neck of control valve (Figure 1, Item 11) and remove control valve (Figure 1, Item 11) from mounting bracket (Figure 1, Item 5).
4. Remove elbows (Figure 1, Item 3) and adapter (Figure 1, Item 6) from three valve ports (Figure 1, Item 4).

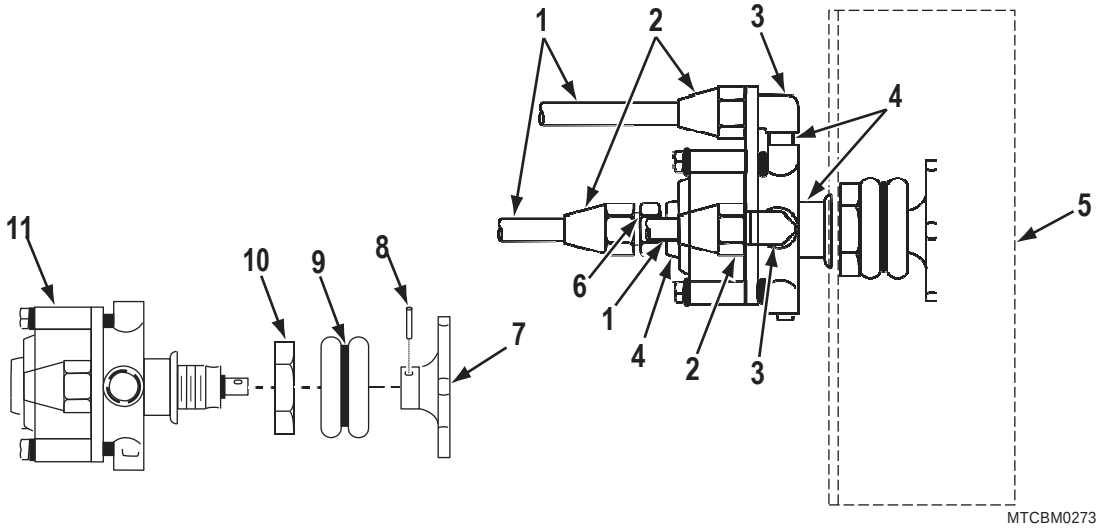


Figure 1. Parking Brake Control Valve Removal.

END OF TASK

INSTALLATION

1. Install elbows (Figure 2, Item 3) and adapter (Figure 2, Item 6) on valve ports (Figure 2, Item 4).
2. Apply antiseize tape to male threads of control valve (Figure 2, Item 11).
3. Install control valve (Figure 2, Item 11) on neck of mounting bracket (Figure 2, Item 5) with nut (Figure 2, Item 10).
4. Install boot (Figure 2, Item 9), button (Figure 2, Item 7), and roll pin (Figure 2, Item 8) on control valve (Figure 2, Item 5).
5. Connect air lines (Figure 2, Item 1) and fittings (Figure 2, Item 2) to elbows (Figure 2, Item 3) and adapter (Figure 2, Item 6) on control valve (Figure 2, Item 11).

END OF TASK

TEST

NOTE

No leakage is permitted. If valve leaks or does not operate, replace valve.

1. Pull button (Figure 2, Item 7) out and check to see that spring brakes apply properly. If spring brakes do not apply properly, internal leakage is present.
2. Apply soap solution around valve stem and check for leakage. If soapy water bubbles around valve stem, external leakage is present.

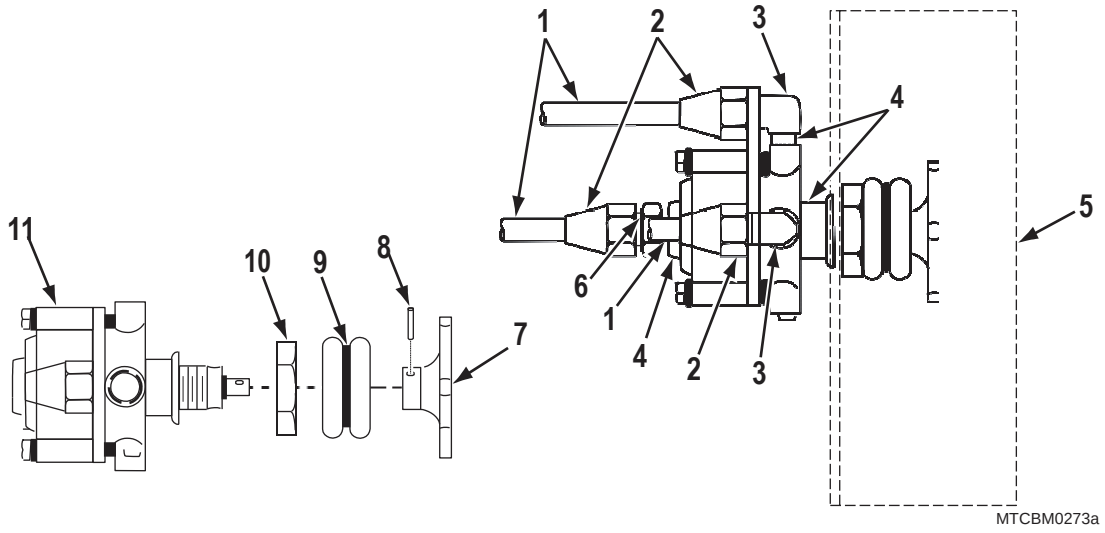


Figure 2. Parking Brake Control Valve Testing.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FULL FUNCTION VALVE AND RELAY VALVE REPLACEMENT (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0086
WP 0285

Materials/Parts
Compound, Antiseize
(WP 0293, Table 1, Item 6)
Soap (WP 0293, Table 1, Item 23)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Air reservoir drain valves opened (WP 0082)

NOTE

Tag all hoses and connectors prior to removal for ease of installation.

FULL FUNCTION VALVE REMOVAL

1. Disconnect fittings (Figure 1, Items 5 and 7) from tee fitting (Figure 1, Item 8).
2. Remove tee fitting (Figure 1, Item 4) from full function valve (Figure 1, Item 2).
3. Disconnect fitting (Figure 1, Item 6) from elbow (Figure 1, Item 4) and remove elbow and hose separator (Figure 1, Item 3) from full function valve (Figure 1, Item 2).
4. Remove full function valve (Figure 1, Item 2) from nipple pipe (Figure 1, Item 1) on pressure tank (Figure 1, Item 9).

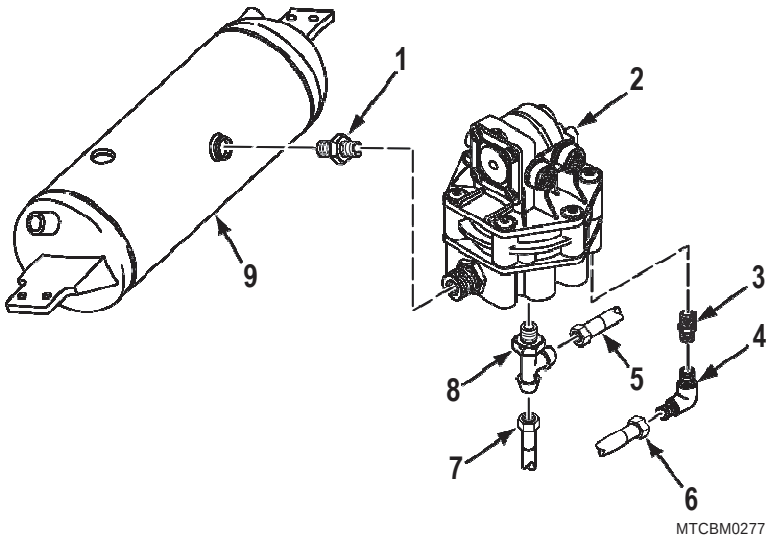


Figure 1. Full Function Valve Removal.

FULL FUNCTION VALVE REMOVAL - Continued

END OF TASK

RELAY VALVE REMOVAL

1. Disconnect fittings (Figure 2, Item 5) from the elbow (Figure 2, Item 4). Remove elbow (Figure 2, Item 4) from relay valve (Figure 2, Item 3).
2. Disconnect fittings (Figure 2, Items 7 and 8) from tee fitting (Figure 2, Item 6). Remove tee fitting (Figure 2, Item 6) from relay valve (Figure 2, Item 3).
3. Remove relay valve (Figure 2, Item 3) from nipple pipe (Figure 2, Item 2) and elbow (Figure 2, Item 1) on pressure tank (Figure 2, Item 16).

END OF TASK

FULL FUNCTION VALVE INSTALLATION

1. Install nipple pipe (Figure 2, Item 17) and full function valve (Figure 2, Item 9) on pressure tank (Figure 2, Item 16).

NOTE

Apply sealing compound to all male pipe threads.

2. Install hose separator (Figure 2, Item 15) and elbow (Figure 2, Item 13) to full function valve (Figure 2, Item 9), connect fitting (Figure 2, Item 14) to elbow (Figure 2, Item 13).
3. Install tee fitting (Figure 2, Item 11) to full function valve (Figure 2, Item 9), connect fittings (Figure 2, Items 10 and 12) to tee fitting (Figure 2, Item 11).

END OF TASK

INSPECTION

Inspect hose ends for damage. Repair or replace if damaged (WP 0285).

END OF TASK

RELAY VALVE INSTALLATION

1. Install elbow (Figure 2, Item 1) and nipple pipe (Figure 2, Item 2) to relay valve (Figure 2, Item 3) on pressure tank (Figure 2, Item 16).

NOTE

Apply sealing compound to all male pipe threads.

2. Install tee fitting (Figure 2, Item 6) to relay valve (Figure 2, Item 3), and connect fitting (Figure 2, Items 7 and 8) to tee fitting (Figure 2, Item 6).
3. Install elbow (Figure 2, Item 4) to relay valve (Figure 2, Item 3), and connect fitting (Figure 2, Item 5) to elbow (Figure 2, Item 4).

RELAY VALVE INSTALLATION - Continued

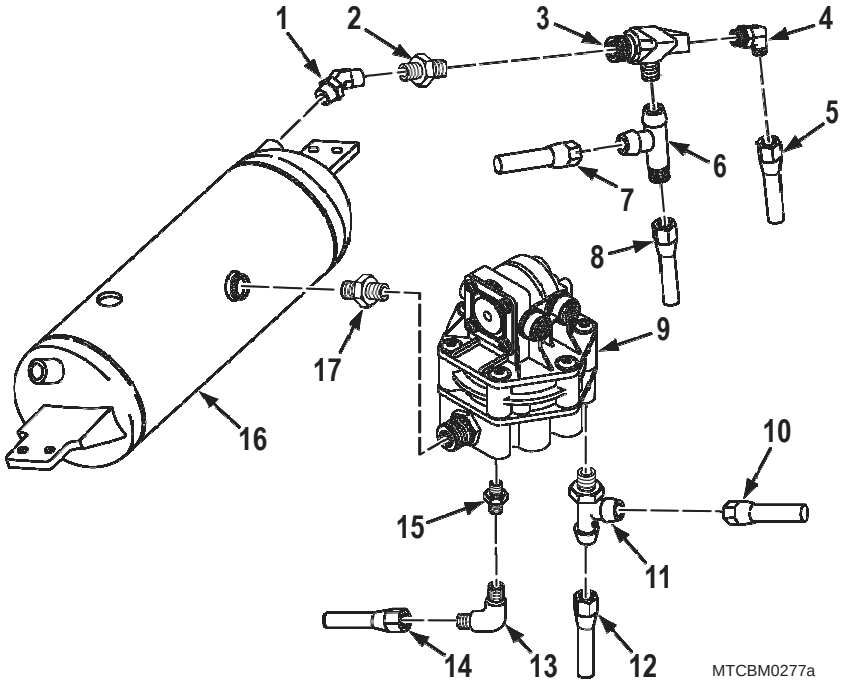


Figure 2. Relay Valve Installation.

END OF TASK

INSPECTION

1. Inspect hose ends for damage. Repair or replace if damaged (WP 0285).
2. Perform leak test (WP 0086).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
EMERGENCY RELAY VALVE REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Air reservoir drain valve opened (WP 0126)

Materials/Parts
Soap (WP 0293, Table 1, Item 23)

REMOVAL

NOTE

Tag all hoses and connectors prior to removal for ease of installation.

1. Disconnect hoses and tube fittings (Figure 1, Item 2) from relay valve (Figure 1, Item 3) on reservoir (Figure 1, Item 4).
2. Remove double check valve (Figure 1, Item 1) from relay valve (Figure 1, Item 3).
3. Remove relay valve (Figure 1, Item 3) from nipple on reservoir (Figure 1, Item 4).

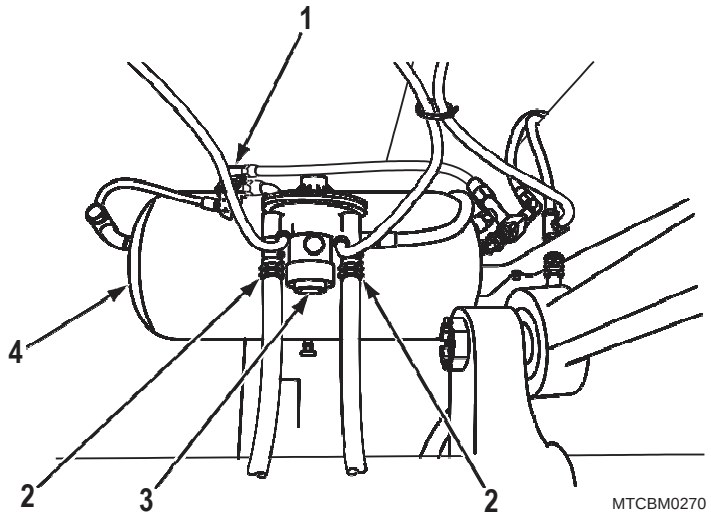


Figure 1. Emergency Relay Valve Removal.

END OF TASK

INSTALLATION

1. Install relay valve (Figure 2, Item 3) on nipple of reservoir (Figure 2, Item 4).
2. Install double check valve (Figure 2, Item 1) on relay valve (Figure 2, Item 3).
3. Connect hoses and lube fittings (Figure 2, Item 2) to relay valve (Figure 2, Item 3).

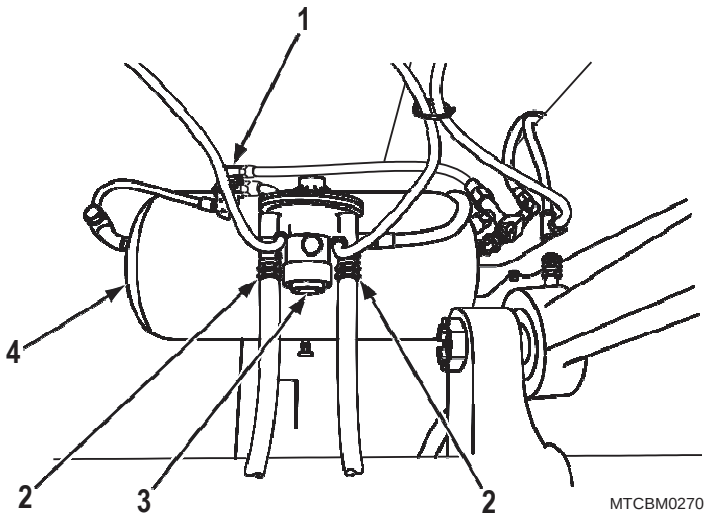


Figure 2. Emergency Relay Valve Installation.

END OF TASK

TEST

1. Connect Prime Mover to semitrailer (WP 0007) and fill air reservoirs.

NOTE

When Prime Mover brake pedal or semitrailer hand brake lever is applied, air is delivered to emergency relay valve. The emergency relay valve releases air from primary brake reservoir to brake chambers to set the brakes.

2. Engage service brake and apply soapy water to exhaust port on top of emergency relay valve. If there is leakage, replace relay valve.
3. Apply and release service brake pedal several times. Listen for immediate response from relay valve. If there is hesitation in brake application and release, replace relay valve.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BRAKE AIR HOSE REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0086
WP 0285

Materials/Parts
Nut, Self-Locking (WP 0295, Table 1, Item 162)
Sealing Compound (WP 0293, Table 1, Item 22)
Soap (WP 0293, Table 1, Item 23)

Equipment Condition
Air reservoir drain valves opened (WP 0082)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

NOTE

Tag all hoses and connectors prior to removal for ease of installation.

REMOVAL

1. Disconnect two brake air hoses (Figure 1, Item 4) from two elbows (Figure 1, Item 3) and air brake chambers (Figure 1, Item 2). Remove hose separator (Figure 1, Item 1) from brake air hoses (Figure 1, Item 4).

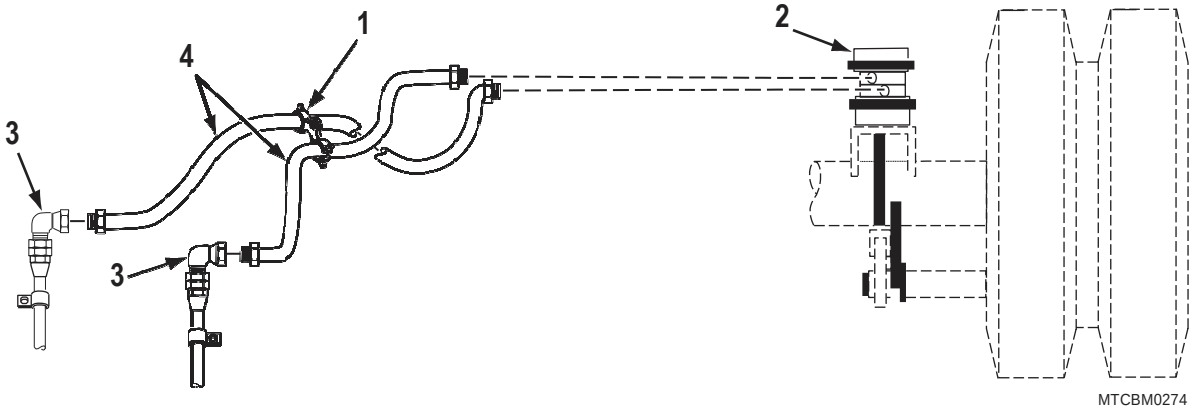


Figure 1. Brake Air Hose Removal.

REMOVAL - Continued

2. Disconnect two brake hoses (Figure 2, Items 7 and 8) from air brake chambers (Figure 2, Item 6), exhaust manifold (Figure 2, Item 9), and pipe reducer (Figure 2, Item 10). Remove hose separator (Figure 2, Item 1) from two air hoses (Figure 2, Items 7 and 8).
3. Remove two retaining straps (Figure 2, Item 15) and two tiedown straps (Figure 2, Item 17) from two brake air hoses (Figure 2, Item 16).
4. Disconnect two air hoses (Figure 2, Item 16) from two adapters (Figure 2, Item 14) and elbows (Figure 2, Item 11).
5. Remove two adapters (Figure 2, Item 14), self-locking nuts (Figure 2, Item 18), fittings (Figure 2, Item 13), and compression sleeves (Figure 2, Item 12), from elbows (Figure 2, Item 11). Discard self-locking nuts (Figure 2, Item 18).
6. Disconnect two hoses (Figure 2, Item 4) from fittings (Figure 2, Item 3) and elbows (Figure 2, Items 2 and 5).

END OF TASK

INSTALLATION

1. Apply sealing compound to all male pipe threads.

NOTE

Proper compression sleeve installation procedures can be found in (WP 0285).

2. Install two fittings (Figure 2, Item 3) and hoses (Figure 2, Items 4) on elbows (Figure 2, Items 2 and 5).

NOTE

Air line hoses are stocked in bulk lengths. Measure original air line hoses and cut new air line hoses to same length. Trim ends of air line hoses to get a smooth, square cut.

3. Install two compression sleeves (Figure 2, Item 12), fittings (Figure 2, Item 13), new self-locking nuts (Figure 2, Item 18), and adapters (Figure 2, Item 14) on elbows (Figure 2, Item 11).
4. Connect two brake air hoses (Figure 2, Item 16) to two adapters (Figure 2, Item 14) and elbows (Figure 2, Item 11). Install two retaining straps (Figure 2, Item 15) and tiedown straps (Figure 2, Item 17) on brake air hoses (Figure 2, Item 16).
5. Connect two brake air hoses (Figure 2, Items 7 and 8) to air brake chamber (Figure 2, Item 6), exhaust manifold (Figure 2, Item 9), and pipe reducer (Figure 2, Item 10).
6. Install hose separator (Figure 2, Item 1) on brake air hoses (Figure 2, Items 7 and 8).
7. Connect two brake air hoses (Figure 2, Item 19) to elbows (Figure 2, Item 11) and air brake chamber (Figure 2, Item 6).
8. Install hose separator (Figure 2, Item 1) on air hoses (Figure 2, Item 19).
9. Connect two hoses (Figure 2, Item 4) to fittings (Figure 2, Item 3) and elbows (Figure 2, Items 2 and 5).

INSTALLATION - Continued

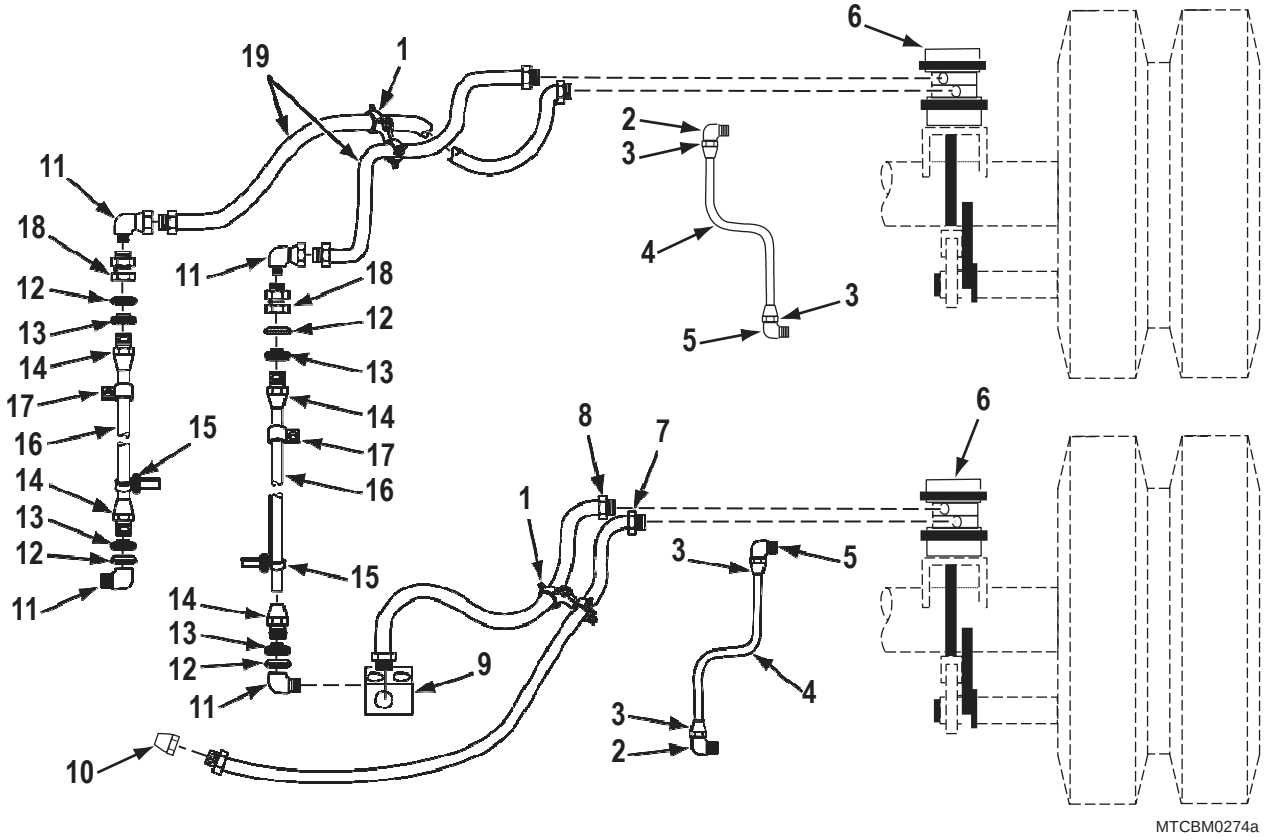


Figure 2. Brake Air Hose Installation.

END OF TASK

FOLLOW ON TASK

1. Perform leak test (WP 0086).
2. Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BRAKE INTERLOCK VALVE MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Compound, Antiseize

Materials/Parts (cont.)
(WP 0293, Table 1, Item 6)
Soap (WP 0293, Table 1, Item 23)

Equipment Condition
Air reservoir drained (WP 0082)
Semitrailer uncoupled (WP 0008)
Semitrailer grounded (WP 0007)

REMOVAL

NOTE

- There are two brake interlock valves. The brake interlock valves are replaced the same way.
- Identify lines prior to disconnecting from brake interlock valve.

1. Disconnect three lines (Figure 1, Item 1) and remove fittings (Figure 1, Item 4) from brake interlock valve (Figure 1, Item 5).
2. Remove two screws (Figure 1, Item 2), flatwashers (Figure 1, Item 3), and brake interlock valve (Figure 1, Item 5) from bottom loading valve (Figure 1, Item 6).

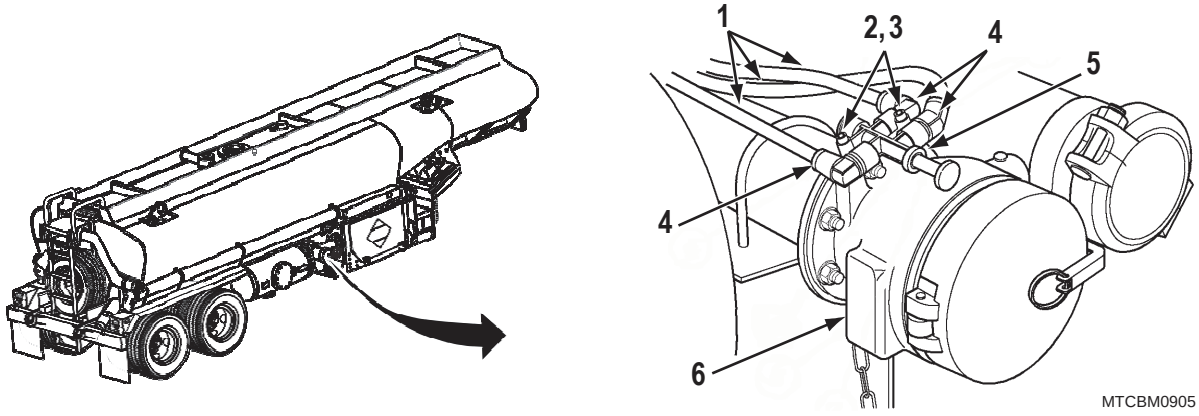


Figure 1. Brake Interlock Valves Removal.

END OF TASK

INSTALLATION

1. Install brake interlock valve (Figure 2, Item 5), two flatwashers (Figure 2, Item 3), and screws (Figure 2, Item 2) to bottom loading valve (Figure 2, Item 7).

NOTE

- Apply thread sealing compound to threads of fittings.
- Do not over-tighten fittings.

2. Install three fittings (Figure 2, Item 4) to brake interlock valve (Figure 2, Item 5) and connect three lines (Figure 2, Item 1).

END OF TASK

TEST

1. With Prime Mover connected (WP 0008) and brake interlock valve (Figure 2, Item 5) applied, coat fittings (Figure 2, Item 4) and connections on brake interlock valve (Figure 2, Item 5) with soapy water.
2. Inspect fittings (Figure 2, Item 4) and brake interlock valve (Figure 2, Item 5) for leakage, indicated by bubbles.
3. If leakage is found at fittings (Figure 2, Item 4), tighten fittings.
4. If leakage is found at plunger (Figure 2, Item 6), replace brake interlock valve (Figure 2, Item 5).

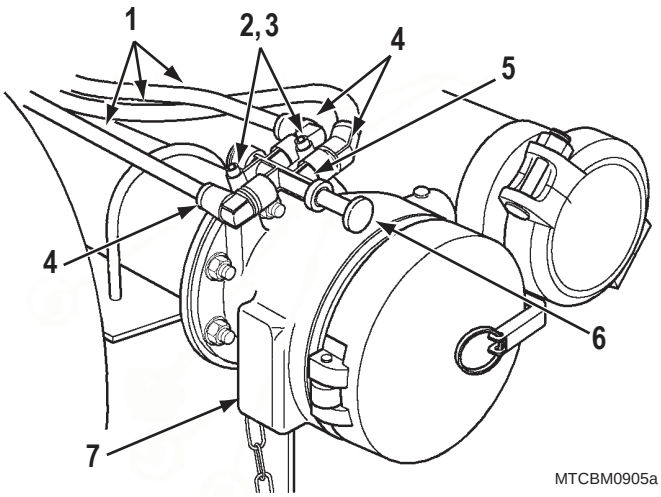


Figure 2. Brake Interlock Valves Maintenance.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HUBS AND BRAKE DRUMS MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)
- Wrench, Torque (WP 0294, Table 1, Item 26)
- Wrench Set, Socket (WP 0294, Table 1, Item 23)

Materials/Parts
- Brush, Stiff Fiber (WP 0293, Table 1, Item 2)
- Gasket Qty: (4) (WP 0295, Table 1, Item 70)
- Grease, Automotive and Artillery (WP 0293, Table 1, Item 14)
- Rag, Wiping (WP 0293, Table 1, Item 20)
- Seal, Plain Qty: (4) (WP 0295, Table 1, Item 152)
- Solvent, Cleaning Compound

Materials/Parts (cont.)
- (WP 0293, Table 1, Item 25)
- Washer, Lock Qty: (24) (WP 0295, Table 1, Item 208)

Personnel Required
- Two

References
- TM 9-214
- WP 0120

Equipment Condition
- Semitrailer uncoupled (WP 0007)
- Semitrailer bonded and grounded (WP 0008)
- Wheel assembly removed (WP 0084)

WARNING

Brake drums weigh 85 lbs (39 kg) and require two people to lift. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

There are four hub and brake drums. This procedure replaces one hub and brake drum. The hubs and brake drum are replaced the same way.

REMOVAL

1. Remove six bolts (Figure 1, Item 12) and lockwashers (Figure 1, Item 11) securing hub cap (Figure 1, Item 13) to hub (Figure 1, Item 10). Remove hub cap (Figure 1, Item 13) and hub cap gasket (Figure 1, Item 14). Discard hub cap gasket (Figure 1, Item 14).
2. Remove outer wheel bearing nut (Figure 1, Item 15), wheel bearing washer (Figure 1, Item 16), lock ring (Figure 1, Item 17), and inner wheel bearing nut (Figure 1, Item 18).
3. Remove outer wheel bearing cone (Figure 1, Item 19).
4. Slide tires, wheels, hub, and brake drum off of axle spindle (Figure 1, Item 7).
5. Remove seal (Figure 1, Item 8) with a seal puller and remove inner wheel bearing cone (Figure 1, Item 9).

NOTE

If wheel studs are bent, cracked, or have stripped threads, perform Step 6.

6. Remove nuts (Figure 1, Items 1, 2, and 6), lockwashers (Figure 1, Item 5), and studs (Figure 1, Item 3) from hub (Figure 1, Item 10) and drum (Figure 1, Item 4). Discard lockwashers (Figure 1, Item 5) and studs (Figure 1, Item 3).

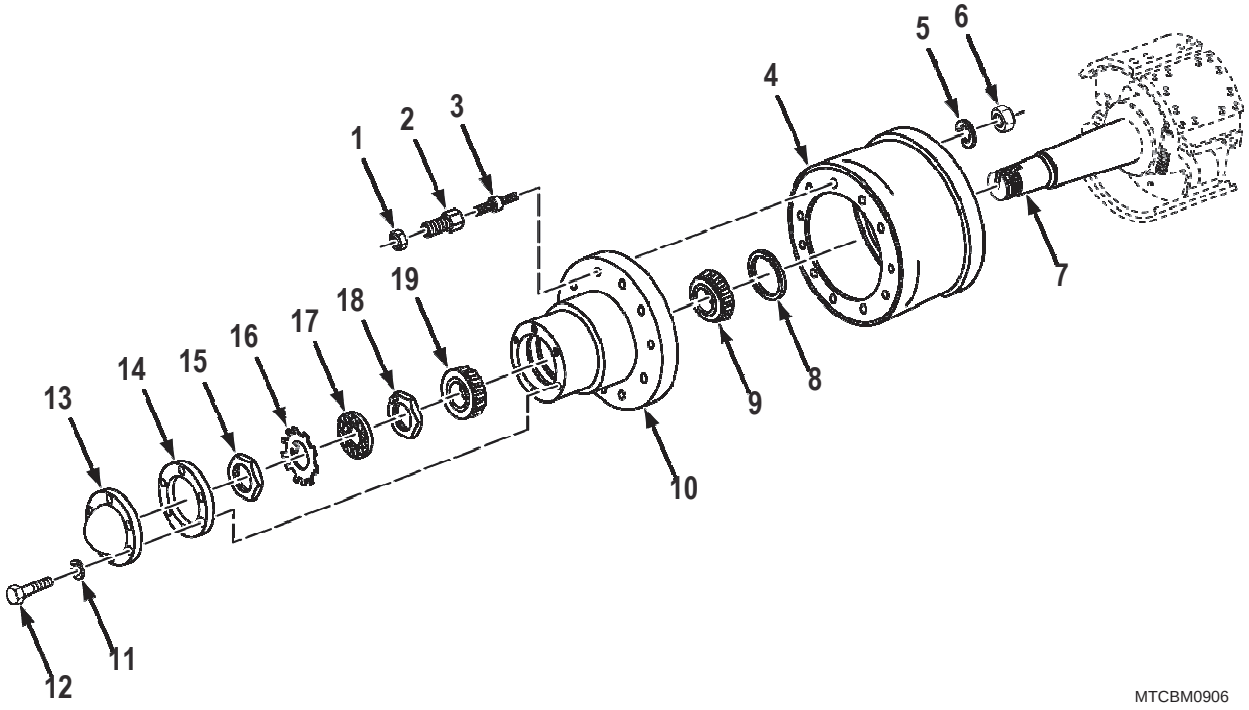


Figure 1. Hub and Brake Drum Removal.

END OF TASK

CLEANING AND INSPECTION

WARNING

- Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible; DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

- Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.
- Do not clean parts with gasoline, in a hot solution tank, or with water and alkaline solutions. Failure to comply may result in damage to, or destruction of, equipment or mission.
- Do not use compressed air to spin bearings. Failure to comply may result in damage to, or destruction of, equipment or mission.

CLEANING AND INSPECTION - Continued

1. Thoroughly clean all parts with dry cleaning solvent and a stiff fiber brush. Ensure that parts are completely dry. Use low pressure compressed air to dry parts, if available.

NOTE

Wheel bearings and bearing cups are matched sets. If wheel bearings need replacing, bearing cups must also be replaced.

2. Inspect wheel bearings for cracks or breaks in bearing cage, etching or pitting on roller surfaces, and any evidence of wear. Replace if worn or damaged.
3. Pack bearings from large end of cone with grease, ensuring that all cavities between rollers and cage are filled. Cover bearings with a clean, lint-free clean dry rag until time to install.
4. Inspect bearing cups in hub for pits, grooves, or flaking. If damaged, use a puller to remove. Drive in new bearing with a suitable driver.
5. Inspect hub cap for damage to flange that would allow water to leak into wheel bearings. Replace if damaged.
6. Replace hub cap gasket.
7. Check threads of studs, screws, and nuts for damage.
8. Inspect brake drum for pitting or scoring. Inspect hub bearing surface for damage. If brake drum is damaged, replace drum.

END OF TASK

INSTALLATION

NOTE

If wheel studs have been removed, perform Step 1. If not, begin at Step 2.

1. Install new studs (Figure 2, Item 3) (short side from shoulder facing out) into hub (Figure 2, Item 10) and drum (Figure 2, Item 4) and secure with new lockwashers (Figure 2, Item 5) and nuts (Figure 2, Items 1, 2, and 6).
2. Ensure that the axle spindle (Figure 2, Item 7) is thoroughly clean.
3. With tire, wheel, hub, and brake drum assembly in upright position, install inner wheel bearing (Figure 2, Item 9).
4. Install inner seal (Figure 2, Item 8) using seal replacer.
5. Install outer wheel bearing cone (Figure 2, Item 19).
6. Install outer wheel bearing nut (Figure 2, Item 15), wheel bearing washer (Figure 2, Item 16), lock ring (Figure 2, Item 17), and inner wheel bearing nut (Figure 2, Item 18).
7. Position hub and drum assembly on spindle. If drum binds on brake shoes when partially installed, adjust brake shoes to reduce brake shoe spread (WP 0120). Push hubs fully onto spindle.
8. Torque inner adjustment nut to minimum of 75 lb ft (101.7 N·m) to ensure proper seating of bearings and cup in wheel hub.
9. Loosen inner adjustment nut so wheel will turn freely.
10. Re-torque inner adjustment nut to 50 lb ft (67.8 N·m) while rotating wheel, in order to properly position bearings for final adjustment.
11. Loosen inner adjustment nut 1/3 turn.

INSTALLATION - Continued

12. Install spindle nut lockwasher so that dowel on inner nut aligns with hole in lockwasher and washer tang sits in spindle keyway.

WARNING

Failure to torque outer wheel bearing nut properly could cause wheel to come off during vehicle operation. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

13. Install outer locknut and torque to 250-400 lb ft (339-542 N·m).

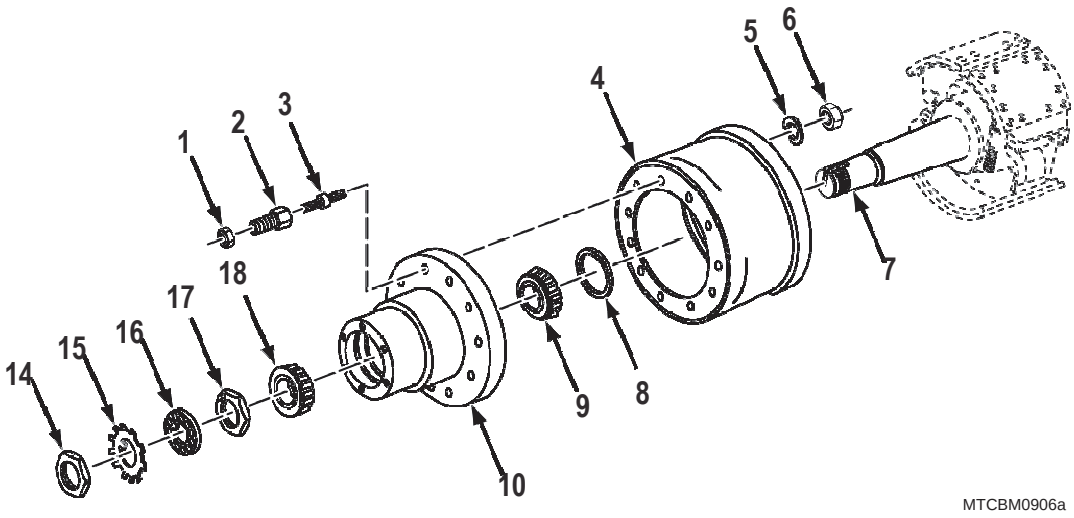


Figure 2. Hub and Brake Drum Installation.

INSTALLATION - Continued

14. Apply a light coat of grease to new hub cap gasket (Figure 3, Item 5) and position gasket on hub (Figure 3, Item 1).
15. Install hub cap (Figure 3, Item 4) and secure with six bolts (Figure 3, Item 2) and new lockwashers (Figure 3, Item 3). Torque bolts (Figure 3, Item 2) to 16-20 lb ft (21.7-27.1 N·m).

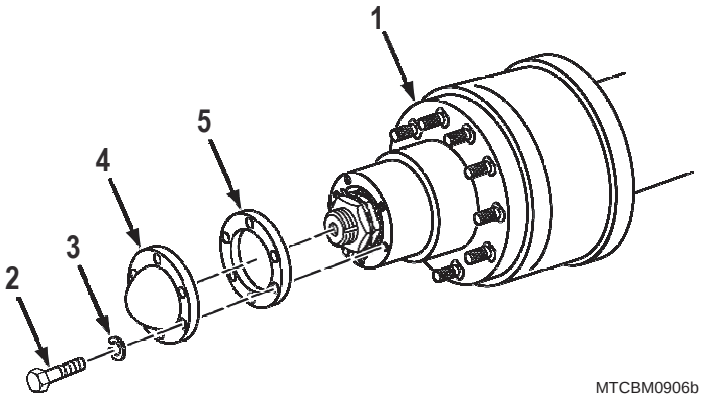


Figure 3. Hub Installation.

END OF TASK

FOLLOW ON TASK

1. Adjust brake (WP 0120).
2. Install wheel assembly (WP 0084).
3. Disconnect semitrailer grounding cables (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HUB AND BRAKE DRUMS MAINTENANCE (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)
- Wrench Set, Socket (WP 0294, Table 1, Item 23)
- Wrench, Torque (WP 0294, Table 1, Item 25)
- Wrench, Torque (WP 0294, Table 1, Item 26)

Materials/Parts
- Brush, Stiff (WP 0293, Table 1, Item 2)
- Gasket (WP 0295, Table 1, Item 70)
- Grease, Automotive (WP 0293, Table 1, Item 13)
- Rag, Wiping (WP 0293, Table 1, Item 20)
- Seal, Plain (WP 0295, Table 1, Item 152)
- Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)

Materials/Parts (cont.)

References
- TM 9-214
- TM 9-2330-329-23P
- WP 0123

Equipment Condition
- Semitrailer uncoupled and grounded (WP 0007)
- Tire and wheel assembly removed (WP 0084)

WARNING

Brake drums weigh 85 lbs (39 kg) and require two people to lift. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

There are four hub and brake drums. This procedure replaces one hub and brake drum. The remaining three hub and brake drums are replaced the same way.

REMOVAL

NOTE

If performing brake system maintenance only, perform Steps 1 thru 3.

1. Rotate slack adjuster manual adjustment counterclockwise until slack adjuster is clear of brake actuator push rod (WP 0123).
2. Remove stud nuts (Figure 1, Item 15) from brake drum (Figure 1, Item 14).
3. Slide brake drum (Figure 1, Item 14) off hub (Figure 1, Item 1).
4. Remove six bolts (Figure 1, Item 13), flatwashers (Figure 1, Item 12), hubcap (Figure 1, Item 11), and gasket (Figure 1, Item 10) from hub (Figure 1, Item 1). Discard gasket (Figure 1, Item 10).

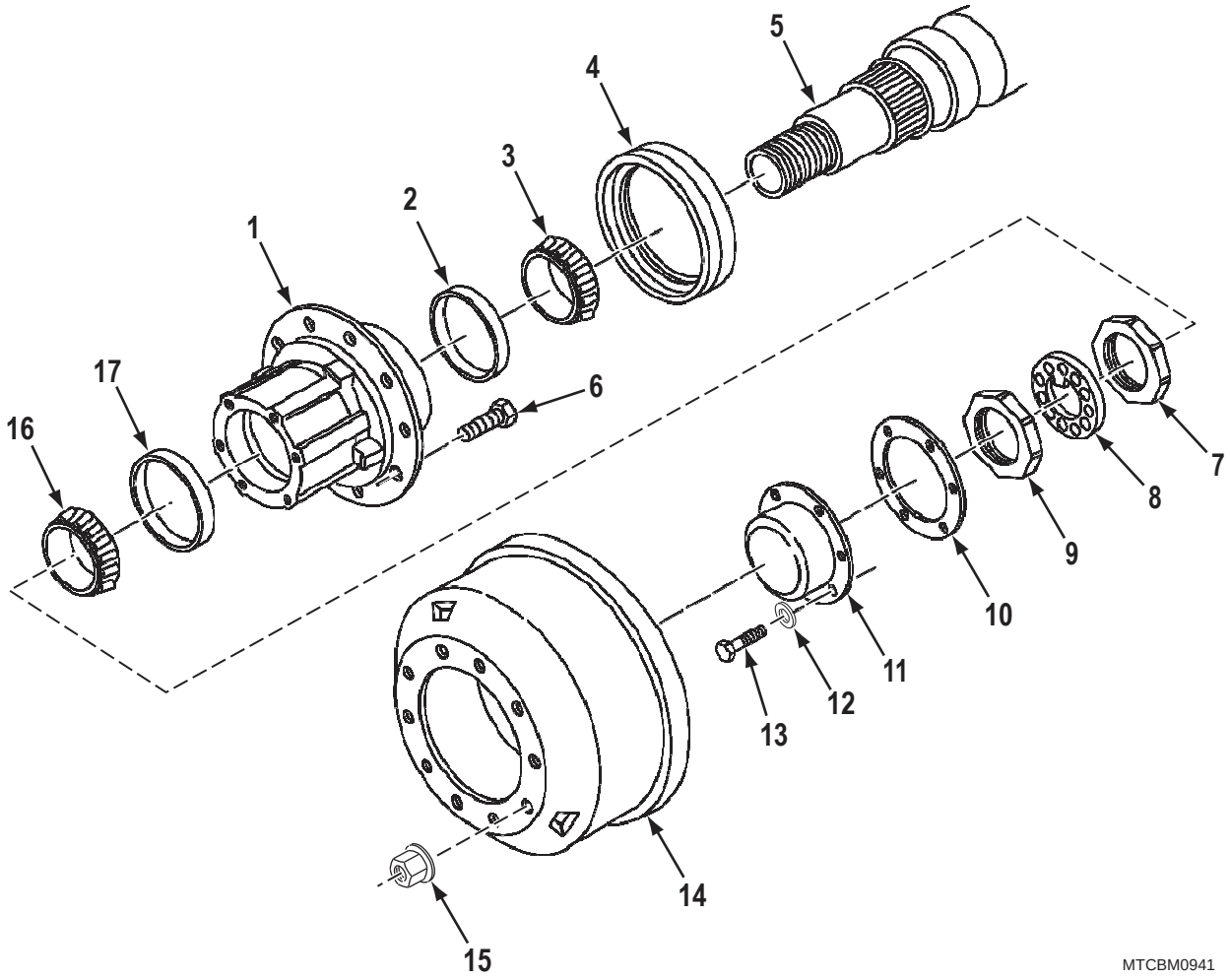


Figure 1. Hub and Brake Drum Assembly Removal.

5. Remove outer bearing nut (Figure 1, Item 9), lock ring (Figure 1, Item 8), and inner wheel nut (Figure 1, Item 7) from spindle (Figure 1, Item 5).
6. Remove outer wheel bearing (Figure 1, Item 16) from hub (Figure 1, Item 1) and slide hub off spindle (Figure 1, Item 5).

REMOVAL - Continued

7. Remove seal (Figure 1, Item 4), inner wheel bearing (Figure 1, Item 3), and cups (Figure 1, Items 2 and 17) from hub (Figure 1, Item 1). Discard seal (Figure 1, Item 4).

NOTE

Wheel studs are only removed if damaged.

8. Remove wheel studs (Figure 1, Item 6).

END OF TASK

CLEANING AND INSPECTION

WARNING

- Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible; DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CLEANING AND INSPECTION - Continued

CAUTION

- Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.
- DO NOT clean parts with gasoline, in a hot solution tank, or with water and alkaline solutions. DO NOT spin bearings with compressed air. Failure to comply may result in damage to, or destruction of, equipment or mission.
- Do not use compressed air to spin bearings. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Thoroughly clean all parts with solvent and a stiff fiber brush. Make sure that parts are completely dry. Use low pressure compressed air to dry parts (TM 9-214).
2. Inspect hub cap (Figure 2, Item 11) for damage to flange that would allow water to leak into wheel bearings. Replace if damaged.
3. Check for damage to threads of studs and screws. Replace if damaged.
4. Inspect drum (Figure 2, Item 14) for pitting or scoring. Replace if damaged.
5. Inspect hub (Figure 2, Item 1) for rust, pitting, or cracks. Replace if damaged.

NOTE

Wheel bearings and bearing cups are matched sets. If wheel bearings need replacing, bearing cups must also be replaced.

6. Inspect inner and outer wheel bearings (Figure 2, Items 3 and 16) for cracks or breaks in bearing cage, etching or pitting on roller surfaces, and any evidence of wear. Replace if worn or damaged.
7. Pack inner and outer wheel bearings (Figure 2, Items 3 and 16) from large end of cone with grease, making sure all cavities between rollers and cage are filled. Cover bearings with clean, lint-free clean dry rag until time to install.
8. Inspect inner and outer bearing cup (Figure 2, Items 2 and 17) in hub for pits, grooves, or flaking. If damaged, replace with new bearing cup.

END OF TASK

INSTALLATION

1. Install wheel studs (Figure 2, Item 6) if removed.
2. Install inner and outer bearing cups (Figure 2, Item 2 and 17) into hub (Figure 2, Item 1).
3. Install inner wheel bearing (Figure 2, Item 3) and new seal (Figure 2, Item 4) into hub (Figure 2, Item 1).
4. Install hub (Figure 2, Item 1) fully to spindle (Figure 2, Item 5).
5. Install outer wheel bearing (Figure 2, Item 16) to spindle (Figure 2, Item 5).
6. Install inner bearing nut (Figure 2, Item 7) to spindle (Figure 2, Item 5) and torque to 75 lb ft (102 N·m) to ensure proper seating of wheel bearings.
7. Loosen inner bearing nut (Figure 2, Item 7) so wheel turns freely.
8. Torque inner wheel bearing nut (Figure 2, Item 7) to 50 lb ft (68 N·m) while rotating hub (Figure 2, Item 1) in order to position bearings for proper adjustment.

INSTALLATION - Continued

WARNING

Failure to back off inner wheel bearing nut could cause bearing and axle spindle overheating or damage, which could result in the wheel locking up or coming off during vehicle operation. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

9. Loosen inner wheel bearing nut (Figure 2, Item 7) 1/3 turn.
10. Install lockring (Figure 2, Item 8) so dowel on inner wheel bearing nut (Figure 2, Item 7) aligns with hole in lockring and tang fits in keyway of spindle (Figure 2, Item 5).
11. Install outer wheel bearing nut (Figure 2, Item 9) and torque to 250-400 lb ft (339-542 N·m).
12. Apply a light coat of grease to new gasket (Figure 2, Item 10) and position gasket on hub (Figure 2, Item 1).
13. Install hub cap (Figure 2, Item 11), six flatwashers (Figure 2, Item 12), and bolts (Figure 2, Item 13) to hub (Figure 2, Item 1).

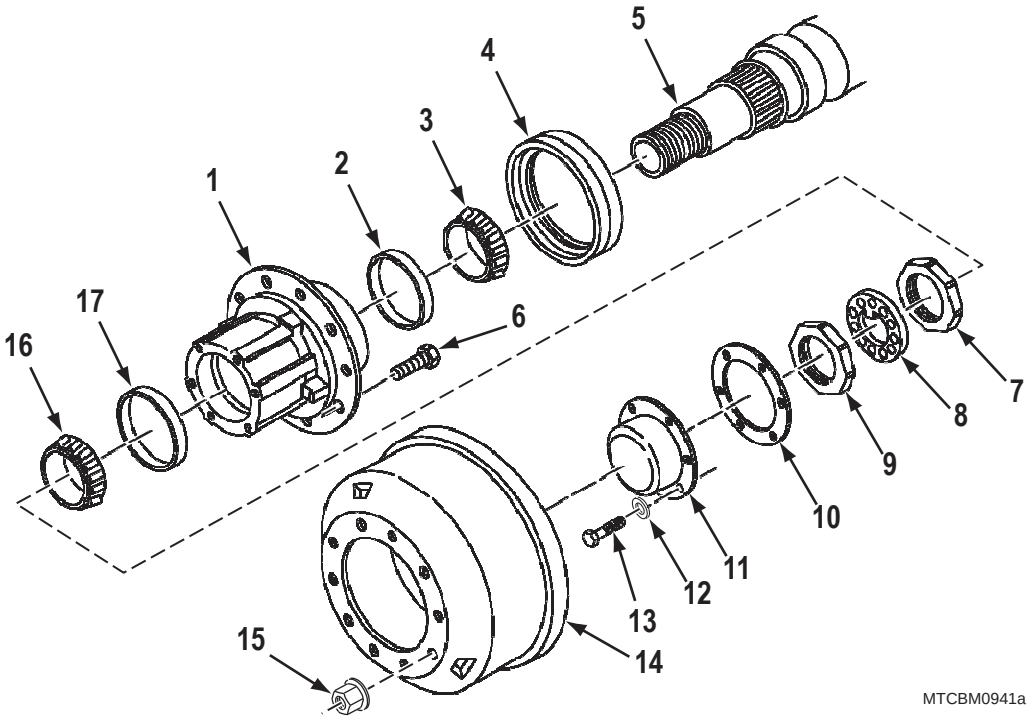


Figure 2. Hub and Brake Drum Assembly Installation.

END OF TASK

FOLLOW ON TASK

1. Install tire and wheel assembly (WP 0084).
2. Adjust brake (WP 0121).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
WHEEL AND TIRE ASSEMBLY MAINTENANCE

INITIAL SETUP:

References
TM 9-2610-200-14

Equipment Condition
Semitrailer uncoupled (WP 0007)

For wheel and tire assembly maintenance, refer to TM 9-2610-200-14.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
KINGPIN COUPLER REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 26)
Wrench Set, Socket (WP 0294, Table 1, Item 22)

Materials/Parts
Corrosion Preventive

Materials/Parts (cont.)
(WP 0293, Table 1, Item 7)
Grease, Automotive and Artillery (WP 0293, Table 1, Item 15)
Nut, Self-Locking
Qty: (12) (WP 0295, Table 1, Item 159)

Equipment Condition
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Support bolt-on upper coupler (Figure 1, Item 3).
2. Remove 12 self-locking nuts (Figure 1, Item 1), washers (Figure 1, Item 2), and screws (Figure 1, Item 4) from bolt-on upper coupler (Figure 1, Item 3). Discard self-locking nuts (Figure 1, Item 1).
3. Remove upper coupler (Figure 1, Item 3) from semitrailer.

END OF TASK

INSTALLATION

1. Support bolt-on upper coupler (kingpin) (Figure 1, Item 3) under semitrailer.
2. Install upper coupler (Figure 1, Item 3) on semitrailer with 12 screws (Figure 1, Item 4), washers (Figure 1, Item 2), and new self-locking nuts (Figure 1, Item 1).
3. Torque self-locking nuts (Figure 1, Item 1) to 130-140 lb ft (176-190 N·m).
4. Lubricate with clean grease.

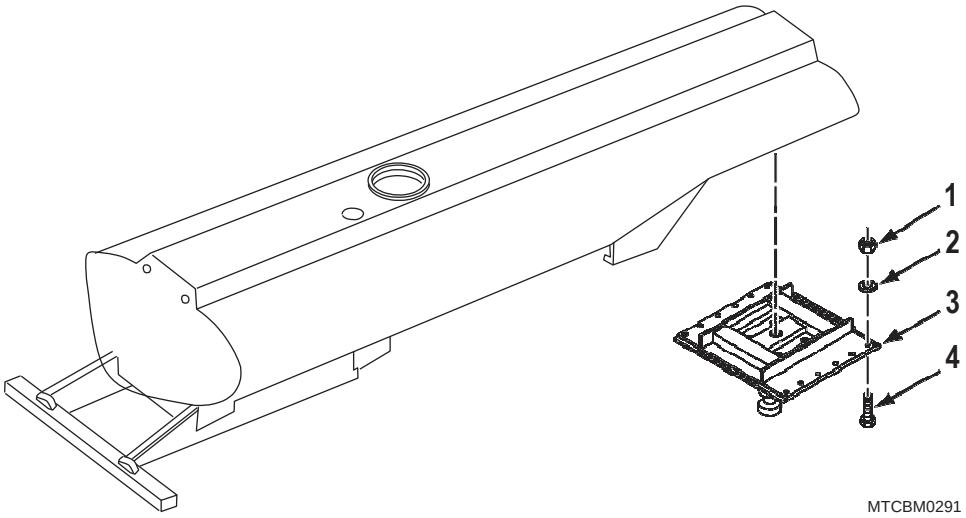


Figure 1. Kingpin Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LANDING GEAR GROUND BOARD REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

Materials/Parts
Nut, Self-Locking (WP 0295, Table 1, Item 59)

DISASSEMBLY

1. Remove two screws (Figure 1, Item 10), washers (Figure 1, Item 6), and nuts (Figure 1, Item 7) from landing gear board (Figure 1, Item 8).
2. Remove handle (Figure 1, Item 9) and chain (Figure 1, Item 1) from board (Figure 1, Item 8).
3. Remove screw (Figure 1, Item 3), self-locking nut (Figure 1, Item 5), two washers (Figure 1, Item 4), and chain (Figure 1, Item 1) from landing gear leg (Figure 1, Item 2). Discard self-locking nut (Figure 1, Item 5).

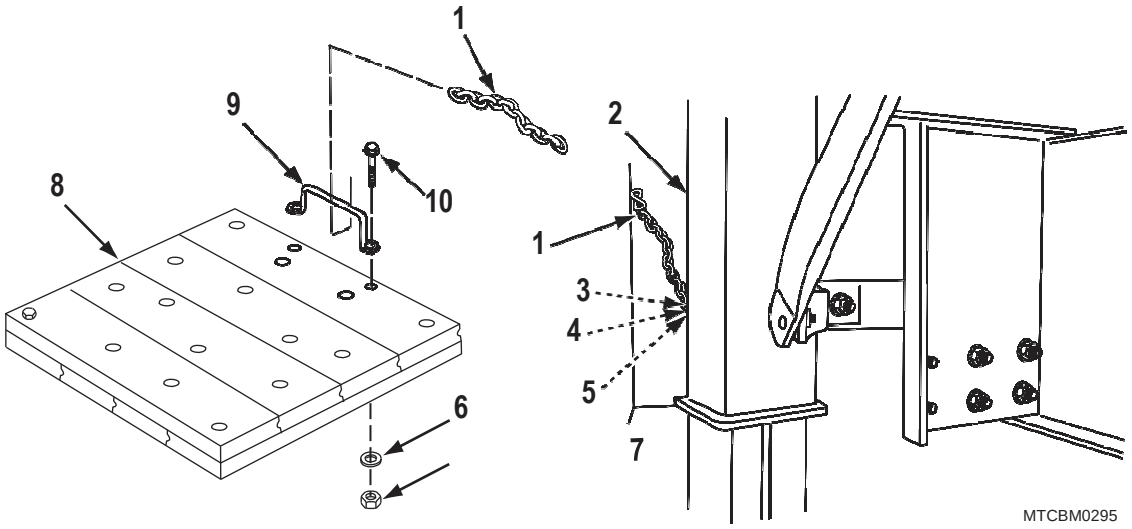


Figure 1. Ground Board Removal.

END OF TASK

ASSEMBLY

1. Install chain (Figure 2, Item 1) on landing gear leg (Figure 2, Item 2) with screw (Figure 2, Item 3), two washers (Figure 2, Item 4), and new self-locking nut (Figure 2, Item 5).
2. Install chain (Figure 2, Item 1) and handle (Figure 2, Item 9) on landing gear board (Figure 2, Item 8) with two screws (Figure 2, Item 10), washers (Figure 2, Item 6), and nuts (Figure 2, Item 7).

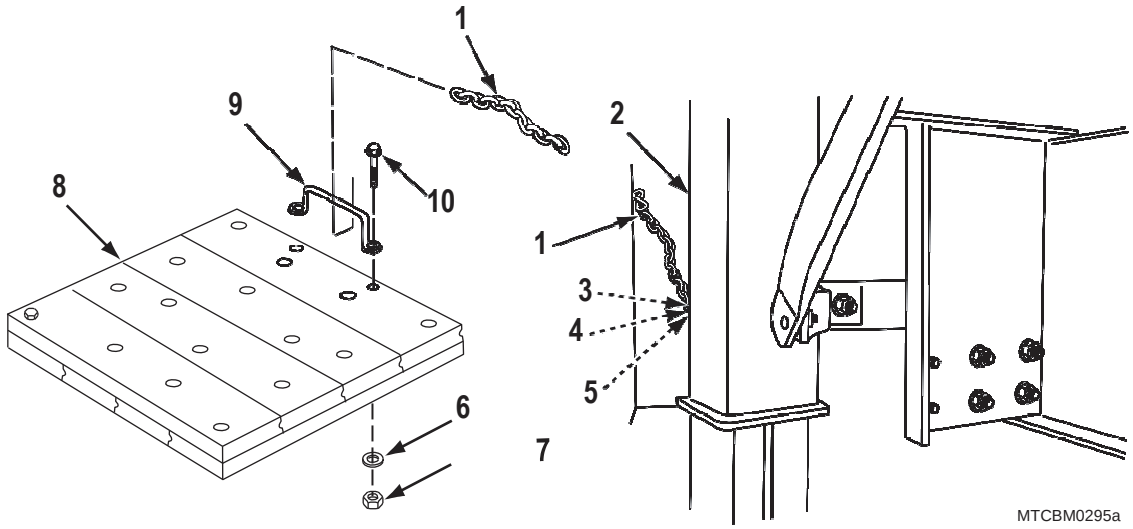


Figure 2. Ground Board Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LANDING GEAR LEG AND SUPPORT SHOE REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (8) (WP 0295, Table 1, Item 160)
Nut, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 164)
Nut, Self-Locking
Qty: (3) (WP 0295, Table 1, Item 166)
Spring Pin (WP 0295, Table 1, Item 169)

Equipment Condition
Remove landing gear hand crank (WP 0141)
Semitrailer uncoupled (WP 0007)

REMOVAL

NOTE

- If round type landing gear legs are damaged, replace with square type landing gear legs.
- Landing gear leg installation is common for both legs.

1. Remove screw (Figure 1, Item 2), self-locking nut (Figure 1, Item 3), and two washers (Figure 1, Item 1) from landing gear leg (Figure 1, Item 7). Discard self-locking nut (Figure 1, Item 3).
2. Remove screw (Figure 1, Item 6), self-locking nut (Figure 1, Item 5), and two washers (Figure 1, Item 4) from landing gear leg (Figure 1, Item 7). Discard self-locking nut (Figure 1, Item 5).

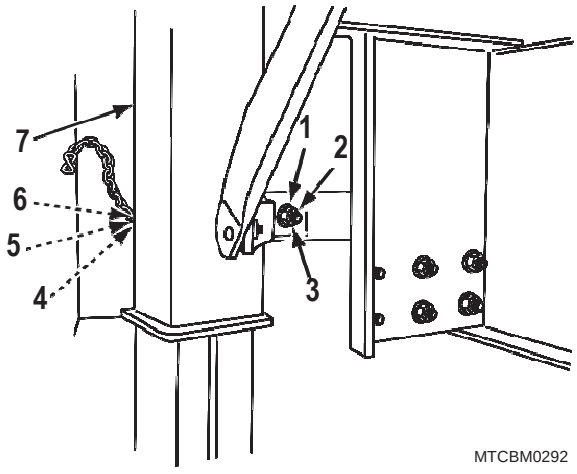


Figure 1. Landing Gear Leg Removal.

REMOVAL - Continued

3. Remove screw (Figure 2, Item 12), self-locking nut (Figure 2, Item 17), and two washers (Figure 2, Item 13) from sliding stay (Figure 2, Item 14) and landing gear leg (Figure 2, Item 6). Discard self-locking nut (Figure 2, Item 17).
4. Remove spring pin (Figure 2, Item 8) from shaft (Figure 2, Item 9). Discard spring pin (Figure 2, Item 8).
5. Remove shaft (Figure 2, Item 9), landing gear shoe (Figure 2, Item 11), and two washers (Figure 2, Item 10) from landing gear leg (Figure 2, Item 6).
6. Remove screw (Figure 2, Item 20), washer (Figure 2, Item 18), and self-locking nut (Figure 2, Item 19) from shaft coupling (Figure 2, Item 3) and landing gear leg (Figure 2, Item 6). Discard self-locking nut (Figure 2, Item 19).
7. Support landing gear leg (Figure 2, Item 6) and remove eight screws (Figure 2, Item 7), self-locking nuts (Figure 2, Item 4), and 16 washers (Figure 2, Item 5) from landing gear leg (Figure 2, Item 6). Remove landing gear leg (Figure 2, Item 6) from semitrailer and discard self-locking nuts (Figure 2, Item 4).
8. Remove screw (Figure 2, Item 2), washer (Figure 2, Item 16), and self-locking nut (Figure 2, Item 15) from shaft coupling (Figure 2, Item 3) and shaft (Figure 2, Item 1). Remove shaft coupling (Figure 2, Item 3) and discard nut (Figure 2, Item 15).

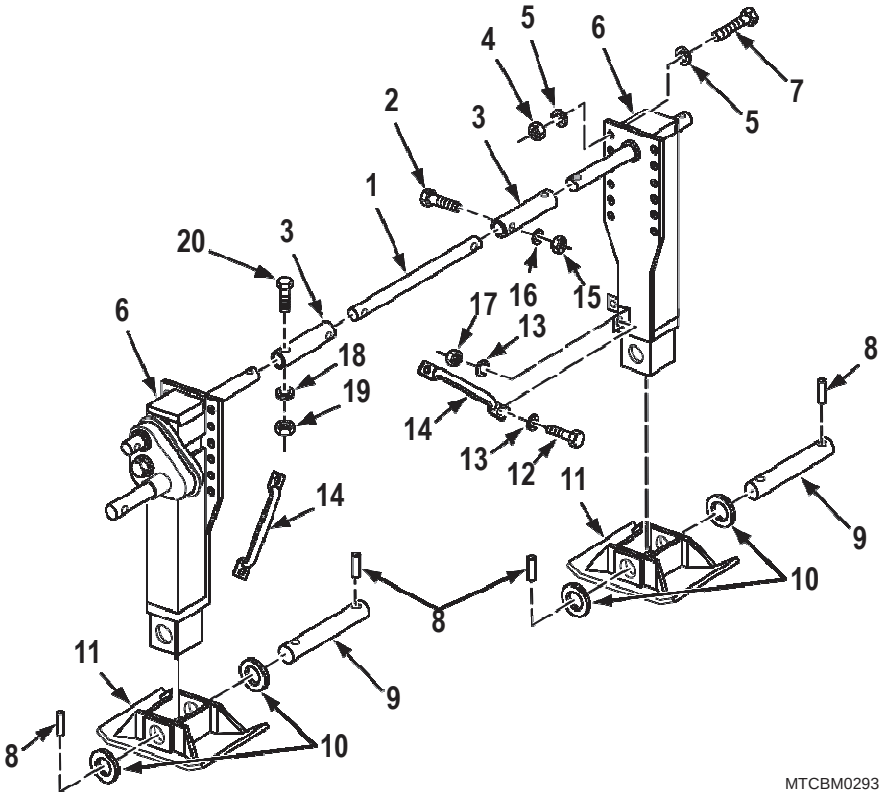


Figure 2. Landing Gear Leg Replacement.

END OF TASK

INSTALLATION

NOTE

Landing gear leg install is common for both sets.

1. Install shaft coupling (Figure 2, Item 3) on shaft (Figure 2, Item 1) with screw (Figure 2, Item 2), washer (Figure 2, Item 16), and new self-locking nut (Figure 2, Item 15).
2. Install landing gear leg (Figure 2, Item 6) on semitrailer with eight screws (Figure 2, Item 7), new self-locking nuts (Figure 2, Item 4), and 16 washers (Figure 2, Item 5).
3. Install shaft coupling (Figure 2, Item 3) on landing gear leg (Figure 2, Item 6) with screw (Figure 2, Item 20), washer (Figure 2, Item 18), and new self-locking nut (Figure 2, Item 19).
4. Install shaft (Figure 2, Item 9), landing gear shoe (Figure 2, Item 11), and two washers (Figure 2, Item 10) on landing gear leg (Figure 2, Item 6). Install new spring pin (Figure 2, Item 8) in shaft (Figure 2, Item 9).
5. Install sliding stay (Figure 2, Item 14) on landing gear leg (Figure 2, Item 6) with screw (Figure 2, Item 12), new self-locking nut (Figure 2, Item 17), and two washers (Figure 2, Item 13).
6. Install screw (Figure 3, Item 6), new self-locking nut (Figure 3, Item 5), and two washers (Figure 3, Item 4) on landing gear leg (Figure 3, Item 7).
7. Install screw (Figure 3, Item 2), new self-locking nut (Figure 3, Item 3), and two washers (Figure 3, Item 1) on landing gear leg (Figure 3, Item 7).

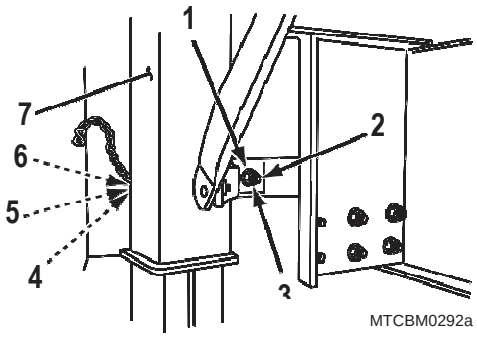


Figure 3. Landing Gear Leg Installation.

END OF TASK

FOLLOW ON TASK

Install landing gear hand crank (WP 0141).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LANDING GEAR HAND CRANK AND DRIVE UNIT REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (12) (WP 0295, Table 1, Item 160)
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 164)
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 209)

Equipment Condition
Raise front end of semitrailer and block securely (WP 0007)
Semitrailer bonded and grounded (WP 0008)
Semitrailer fuel tank drained (WP 0201)

REMOVAL – OLD CONFIGURATION

NOTE

Drive unit is attached to curbside landing gear leg only.

1. Remove screw (Figure 1, Item 3), washer (Figure 1, Item 5), and self-locking nut (Figure 1, Item 6) from coupling (Figure 1, Item 4). Discard self-locking nut (Figure 1, Item 6).
2. Support drive unit (Figure 1, Item 7) and remove four screws (Figure 1, Item 8), washers (Figure 1, Item 1), and self-locking nuts (Figure 1, Item 2) from drive unit (Figure 1, Item 7). Discard self-locking nuts (Figure 1, Item 2).

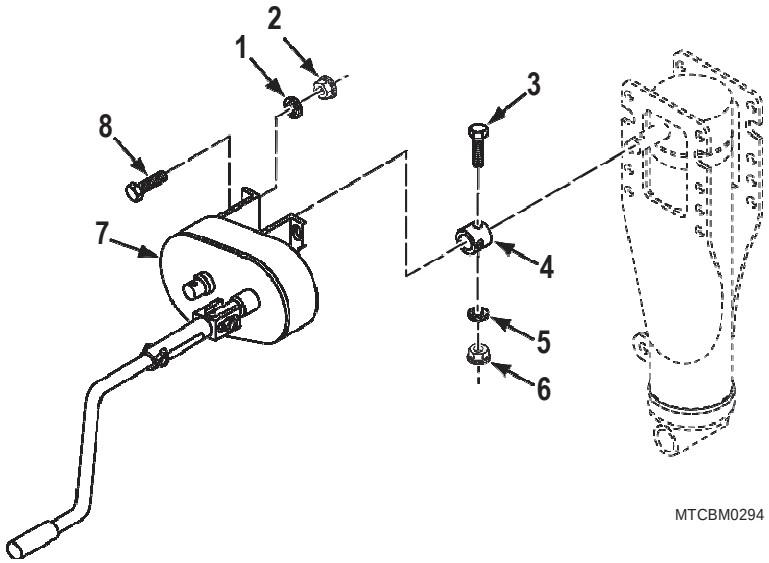


Figure 1. Drive Unit Removal.

REMOVAL – OLD CONFIGURATION - Continued

3. Remove drive unit (Figure 2, Item 18) from landing gear leg (Figure 2, Item 6).
4. Remove screw (Figure 2, Item 3), washer (Figure 2, Item 7), and self-locking nut (Figure 2, Item 8) from coupling (Figure 2, Item 5). Remove coupling (Figure 2, Item 5) from drive unit (Figure 2, Item 18). Discard self-locking nut (Figure 2, Item 8).
5. Remove screw (Figure 2, Item 15) and self-locking nut (Figure 2, Item 13) from hand crank (Figure 2, Item 14). Remove hand crank (Figure 2, Item 14) from handle (Figure 2, Item 16). Discard self-locking nut (Figure 2, Item 13).
6. Remove screw (Figure 2, Item 17), washer (Figure 2, Item 12), and self-locking nut (Figure 2, Item 11) from handle (Figure 2, Item 16). Remove handle (Figure 2, Item 16) from drive unit (Figure 2, Item 18). Discard self-locking nut (Figure 2, Item 11).

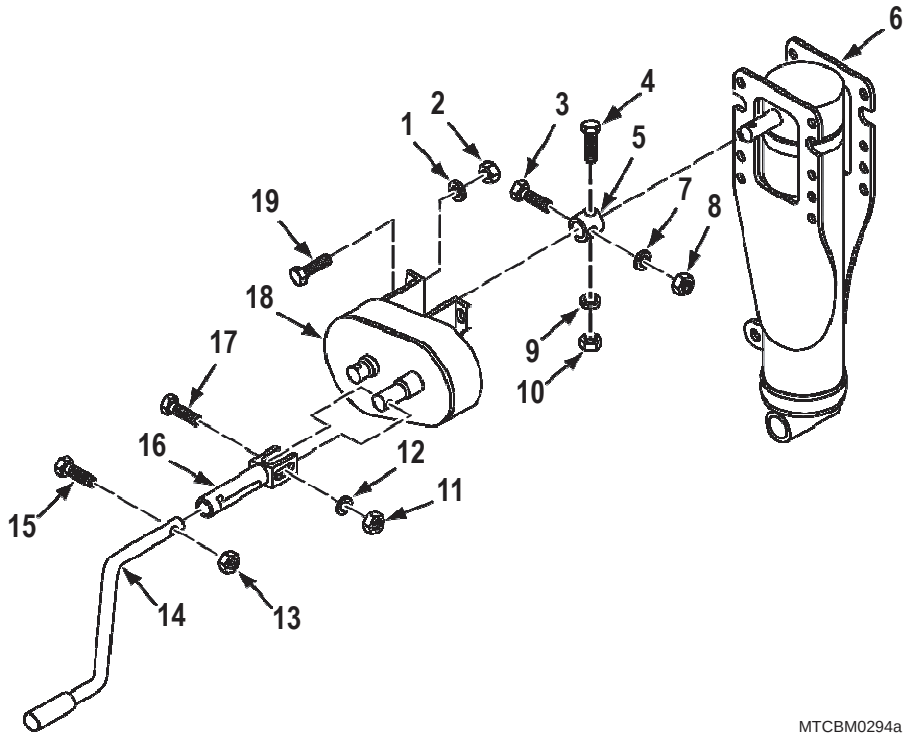


Figure 2. Hand Crank and Drive Unit Removal.

NOTE

Step 7 is for the square model landing gear only.

7. Remove nut (Figure 3, Item 4), bolt (Figure 3, Item 5), shaft (Figure 3, Item 2), and landing gear shoe (Figure 3, Item 3) from landing gear leg (Figure 3, Item 1).

REMOVAL – OLD CONFIGURATION - Continued

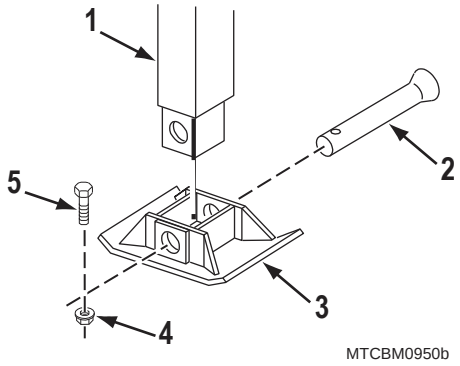


Figure 3. Landing Gear Leg.

END OF TASK

INSTALLATION – OLD CONFIGURATION

NOTE

- Drive unit is installed on curbside landing gear leg.
- Step 1 is for the square model landing gear only.

1. Install landing gear shoe (Figure 3, Item 3), shaft (Figure 3, Item 2), bolt (Figure 3, Item 5), and nut (Figure 3, Item 4) to landing gear leg (Figure 3, Item 1).
2. Install handle (Figure 2, Item 16) on drive unit (Figure 2, Item 18) with screw (Figure 2, Item 17), washer (Figure 2, Item 12), and new self-locking nut (Figure 2, Item 11).
3. Install hand crank (Figure 2, Item 14) on handle (Figure 2, Item 16) with screw (Figure 2, Item 15) and new self-locking nut (Figure 2, Item 13).
4. Install coupling (Figure 2, Item 5) on drive unit (Figure 2, Item 18) with screw (Figure 2, Item 3), washer (Figure 2, Item 7), and new self-locking nut (Figure 2, Item 8).
5. Install drive unit (Figure 2, Item 18) on landing gear leg (Figure 2, Item 6) with four screws (Figure 2, Item 19), washers (Figure 2, Item 1), and new self-locking nuts (Figure 2, Item 2).
6. Install coupling (Figure 2, Item 5) on landing gear leg (Figure 2, Item 6) with screw (Figure 2, Item 4), washer (Figure 2, Item 9), and new self-locking nut (Figure 2, Item 10).

END OF TASK

FOLLOW ON TASK

Lower front end of semitrailer (WP 0007).

END OF TASK

REMOVAL – NEW CONFIGURATION

WARNING

Landing leg weighs 110 Ib (50 kg). Two people are required to lift landing leg. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

- Landing gear legs should be raised 6 in. (152 mm) off the ground prior to performing this procedure.
- Semitrailer must be on jack stands or connected to a Prime Mover prior to performing this procedure.

1. Remove nut (Figure 4, Item 22), two washers (Figure 4, Item 23), bolt (Figure 4, Item 25), and hand crank (Figure 4, Item 24) from shaft (Figure 4, Item 26).
2. Remove self-locking nut (Figure 4, Item 17), two washers (Figure 4, Item 12), and bolt (Figure 4, Item 11) from leg support bracket (Figure 4, Item 6). Discard self-locking nut (Figure 4, Item 17).
3. Remove self-locking nut (Figure 4, Item 15), two washers (Figure 4, Item 14), and bolt (Figure 4, Item 16) from landing gear leg support (Figure 4, Item 5). Discard self-locking nut (Figure 4, Item 15).
4. Remove two self-locking nuts (Figure 4, Item 10), four washers (Figure 4, Item 9), two bolts (Figure 4, Item 8), and cross-drive shaft (Figure 4, Item 7) from semitrailer. Discard self-locking nuts (Figure 4, Item 10).
5. Remove eight self-locking nuts (Figure 4, Item 3), washers (Figure 4, Item 2), and bolts (Figure 4, Item 1) from landing gear leg bracket (Figure 4, Item 4). Discard self-locking nuts (Figure 4, Item 3). Remove landing gear leg (Figure 4, Item 13).
6. Remove nut (Figure 4, Item 20), bolt (Figure 4, Item 21), shaft (Figure 4, Item 18), and landing gear shoe (Figure 4, Item 19) from landing gear leg (Figure 4, Item 13).

REMOVAL – NEW CONFIGURATION - Continued

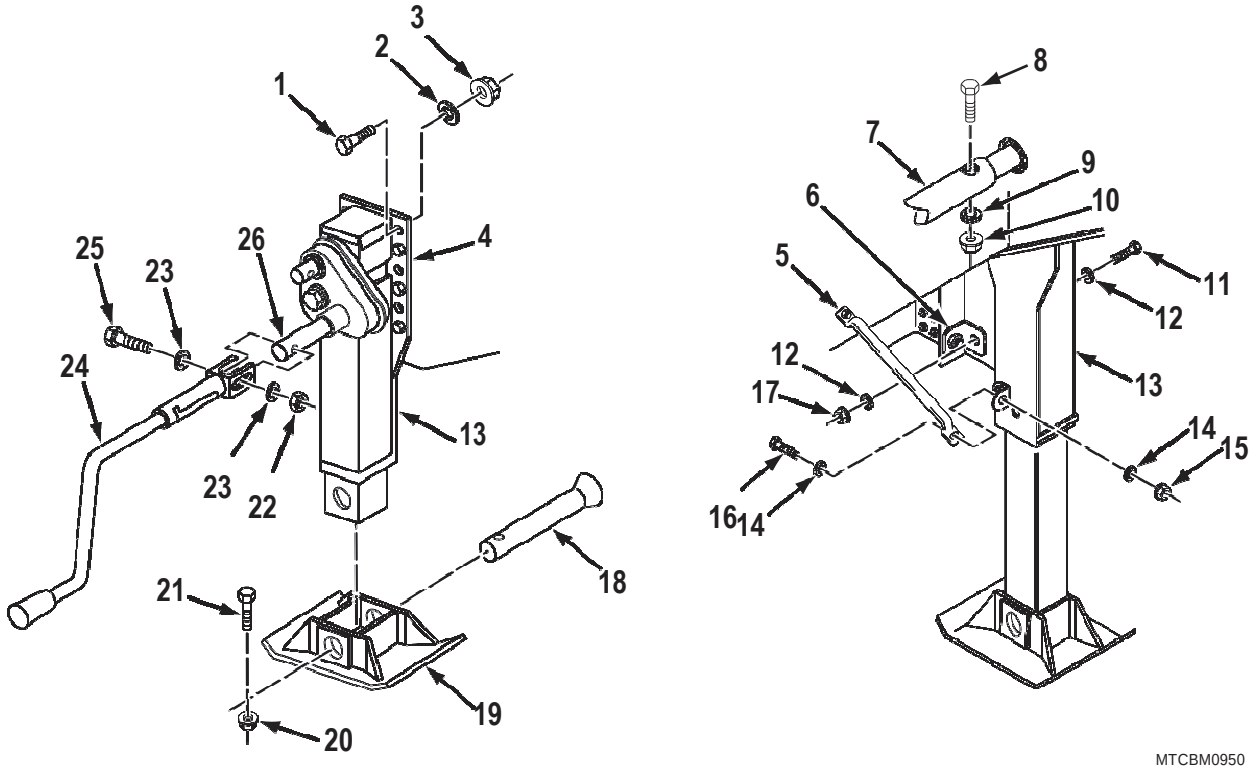


Figure 4. Roadside Landing Leg Removal.

END OF TASK

INSTALLATION – NEW CONFIGURATION

1. Install landing gear shoe (Figure 4, Item 19), shaft (Figure 4, Item 18), bolt (Figure 4, Item 21), and nut (Figure 4, Item 20) to landing gear leg (Figure 4, Item 13).
2. Install landing gear leg (Figure 4, Item 13), eight bolts (Figure 4, Item 1), washers (Figure 4, Item 2), and new self-locking nuts (Figure 4, Item 3) to landing leg bracket (Figure 4, Item 4).
3. Install cross-drive shaft (Figure 4, Item 7), two bolts (Figure 4, Item 8), four washers (Figure 4, Item 9), and two new self-locking nuts (Figure 4, Item 10) to semitrailer.
4. Install bolt (Figure 4, Item 16), two washers (Figure 4, Item 14), and new self-locking nut (Figure 4, Item 15) to landing gear leg support (Figure 4, Item 13).
5. Install bolt (Figure 4, Item 11), two washers (Figure 4, Item 12), and new self-locking nut (Figure 4, Item 17) to leg support bracket (Figure 4, Item 6).
6. Install hand crank (Figure 4, Item 24), two washers (Figure 4, Item 23), bolt (Figure 4, Item 25), and nut (Figure 4, Item 22) to shaft (Figure 4, Item 26).

END OF TASK

FOLLOW ON TASK

1. Disconnect semitrailer grounding cables (WP 0008).
2. Lubricate landing leg (WP 0286).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LEAF SPRING ASSEMBLY MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Wrench, Torque
(WP 0294, Table 1, Item 26)
Wrench Set, Socket
(WP 0294, Table 1, Item 23)

Materials/Parts
Grease, Automotive and Artillery

Materials/Parts (cont.)
(WP 0293, Table 1, Item 12)

Equipment Condition
Air reservoir drained (WP 0082)
Bogie assembly removed (WP 0117)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)
Axle removed (WP 0084)

REMOVAL

NOTE

Semitrailer has two leaf spring assemblies. This procedure covers only one leaf spring assembly.

1. Remove four nuts (Figure 1, Item 3) and washers (Figure 1, Item 2) from two U-bolts (Figure 1, Item 1).

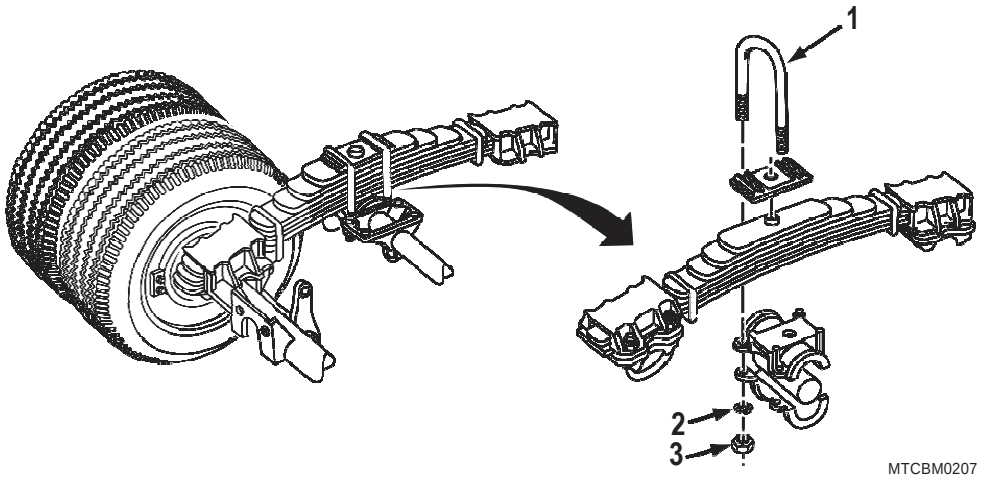


Figure 1. Leaf Spring Assembly Removal.

REMOVAL - Continued

2. Remove two U-bolts (Figure 2, Item 1), wear plate (Figure 2, Item 2), and lower trunnion hub (Figure 2, Item 6) from leaf spring assembly (Figure 2, Item 3) and trunnion tube (Figure 2, Item 9).
3. Using suitable lifting device, remove leaf spring assembly (Figure 2, Item 3) from upper trunnion hub (Figure 2, Item 4).
4. Remove upper trunnion hub (Figure 2, Item 4), rubber bushing (Figure 2, Item 5), and trunnion washer (Figure 2, Item 2) from trunnion tube (Figure 2, Item 9).

END OF TASK

INSPECTION

Inspect rubber bushings and trunnion washers for wear and replace as needed.

END OF TASK

INSTALLATION

1. Install trunnion washer (Figure 2, Item 2), rubber bushing (Figure 2, Item 5), and upper trunnion hub (Figure 2, Item 4) on trunnion tube (Figure 2, Item 9).
2. Using suitable lifting device, position leaf spring assembly (Figure 2, Item 3) on upper trunnion hub (Figure 2, Item 4).
3. Install two U-bolts (Figure 2, Item 1) over wear plate (Figure 2, Item 2) and through holes in upper and lower trunnion hubs (Figure 2, Items 4 and 6).
4. Install four washers (Figure 2, Item 7) and nuts (Figure 2, Item 8) on two U-bolts (Figure 2, Item 1) and torque evenly between 200-320 lb ft (271-434 N·m).

INSTALLATION - Continued

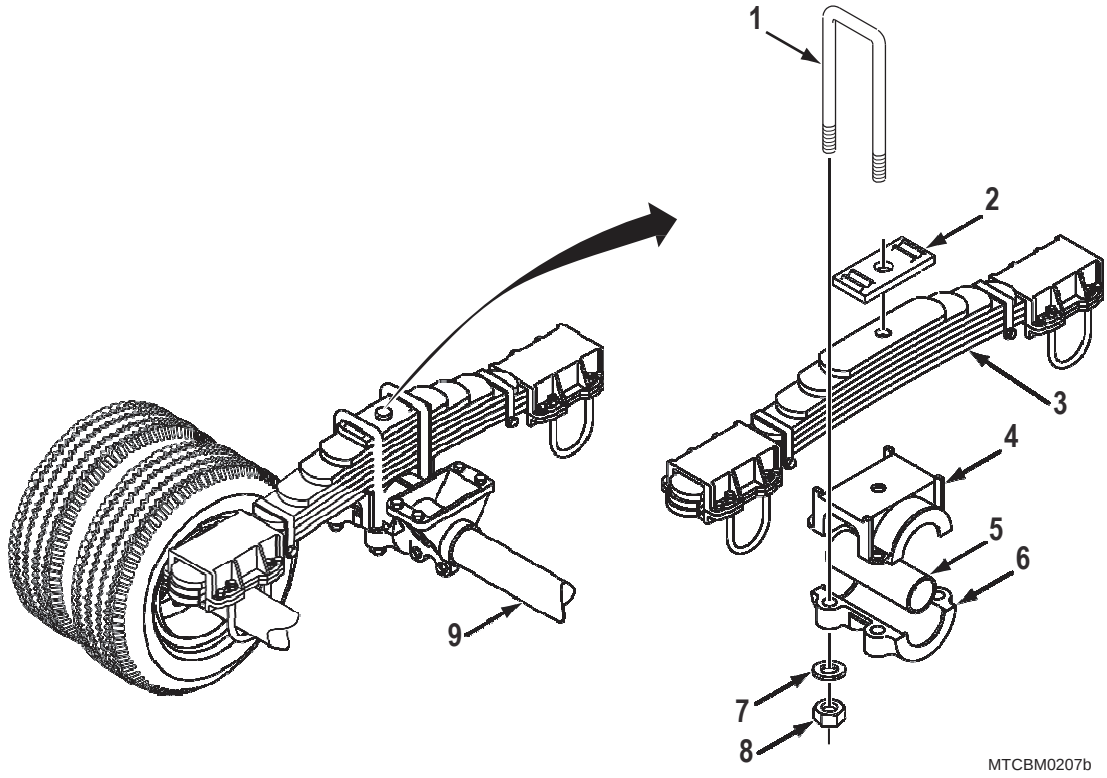


Figure 2. Leaf Spring Assembly Replacement.

END OF TASK

FOLLOW ON TASK

1. Install axle (WP 0084).
2. Install bogie assembly (WP 0117).
3. Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LEAF SPRING ASSEMBLY REPLACEMENT (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Wrench, Torque (WP 0294, Table 1, Item 26)
- Wrench Set, Socket (WP 0294, Table 1, Item 23)

Equipment Condition
- Semitrailer uncoupled (WP 0007)

Equipment Condition (cont.)
- Semitrailer bonded and grounded (WP 0008)
- Air reservoir drained (WP 0082)
- Fuel tank drained (WP 0007)
- Axle removed (WP 0084)

NOTE

Semitrailer has two leaf springs. This procedure covers only one leaf spring.

REMOVAL

1. Remove four nuts (Figure 1, Item 7) and washers (Figure 1, Item 6) from two U-bolts (Figure 1, Item 1).
2. Remove two U-bolts (Figure 1, Item 1) and wear plate (Figure 1, Item 2) from leaf spring (Figure 1, Item 8) and trunnion tube (Figure 1, Item 10).
3. Using suitable lifting device, remove leaf spring (Figure 1, Item 8) from upper trunnion hub (Figure 1, Item 3).
4. Remove upper trunnion hub (Figure 1, Item 3), lower trunnion hub (Figure 1, Item 5), rubber bushing (Figure 1, Item 4), and trunnion washer (Figure 1, Item 9) from trunnion tube (Figure 1, Item 10).

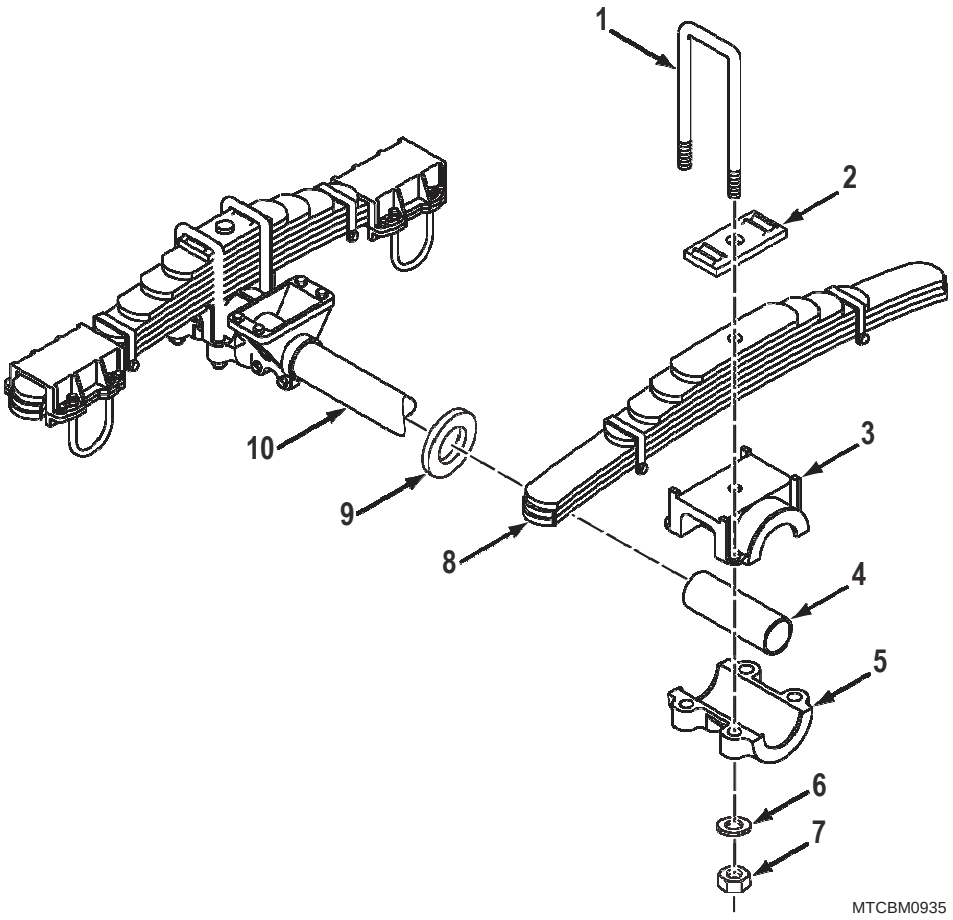


Figure 1. Leaf Spring Assembly Removal.

END OF TASK

INSPECTION

Inspect rubber bushings (Figure 1, Item 4) and trunnion washers (Figure 1, Item 9) for wear and replace as needed.

END OF TASK

INSTALLATION

1. Install trunnion washer (Figure 1, Item 9), rubber bushing (Figure 1, Item 4), upper trunnion hub (Figure 1, Item 3), and lower trunnion hub (Figure 1, Item 5) on trunnion tube (Figure 1, Item 10).
2. Using suitable lifting device, position leaf spring (Figure 1, Item 8) on upper trunnion hub (Figure 1, Item 3) so that center bolt of leaf spring is in recess of upper trunnion hub (Figure 1, Item 3).
3. Position wear plate (Figure 1, Item 2) in place on leaf spring (Figure 1, Item 8). Nut on center bolt of leaf spring fits into hole in wear plate (Figure 1, Item 2).
4. Install two U-bolts (Figure 1, Item 1) over wear plate (Figure 1, Item 2) and through holes in upper and lower trunnion hubs (Figure 1, Items 3 and 5).
5. Install four washers (Figure 1, Item 6) and nuts (Figure 1, Item 7) on two U-bolts (Figure 1, Item 1) and torque to 200 to 320 lb ft (271-434 N·m)
6. Repeat Steps 1 thru 5 for opposite side.

END OF TASK

FOLLOW ON TASK

1. Install axle (WP 0084).
2. Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
MUDFLAP ASSEMBLY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Drill, Electric, Portable
(WP 0294, Table 1, Item 7)
Drill Set, Twist
(WP 0294, Table 1, Item 8)

Materials/Parts
Washer, Lock
Qty: (4) (WP 0295, Table 1, Item 193)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

Remove four bolts (Figure 1, Item 1), four lockwashers (Figure 1, Item 2), bracket (Figure 1, Item 3), mudflap (Figure 1, Item 4), and four nuts (Figure 1, Item 5) from rear bumper. Discard lockwashers (Figure 1, Item 2).

END OF TASK

INSTALLATION

1. Cut and drill new mudflaps using the bracket as a template.
2. Install bracket (Figure 1, Item 3) on top side of mudflap (Figure 1, Item 4) and install mudflap (Figure 1, Item 4) on rear bumper with four bolts (Figure 1, Item 1), new lockwashers (Figure 1, Item 2), and nuts (Figure 1, Item 5).

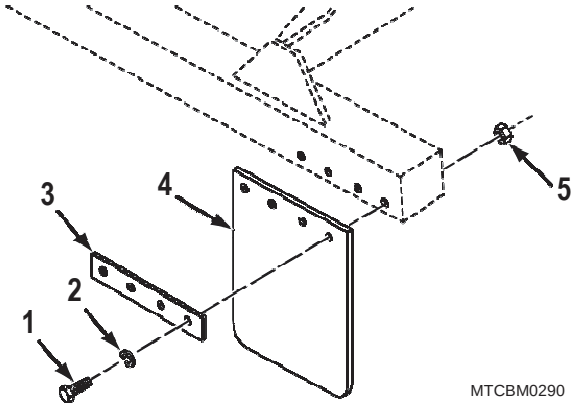


Figure 1. Mudflap Assembly Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HOSE TROUGH ACCESS COVER REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 178)
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (4) (WP 0295, Table 1, Item 161)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

REMOVAL

NOTE

- Use this work package for roadside or curbside access cover removal. Roadside access cover is shown.
- M969A1 models have wire rope assemblies. All other models use webbing.

1. Unhook snap hook (Figure 1, Item 7) from hose trough ring (Figure 1, Item 8).
2. Remove four screws (Figure 1, Item 11), washers (Figure 1, Item 10), and self-locking nuts (Figure 1, Item 9) from access cover (Figure 1, Item 1) and hose trough (Figure 1, Item 6). Discard self-locking nuts (Figure 1, Item 9).
3. Open access cover (Figure 1, Item 1) and remove two screws (Figure 1, Item 3), four washers (Figure 1, Item 4), two self-locking nuts (Figure 1, Item 5), and webbings or wire rope assemblies (Figure 1, Item 2) from hose trough (Figure 1, Item 6). Discard self-locking nuts (Figure 1, Item 5).
4. Remove access cover (Figure 1, Item 1) from hose trough (Figure 1, Item 6).

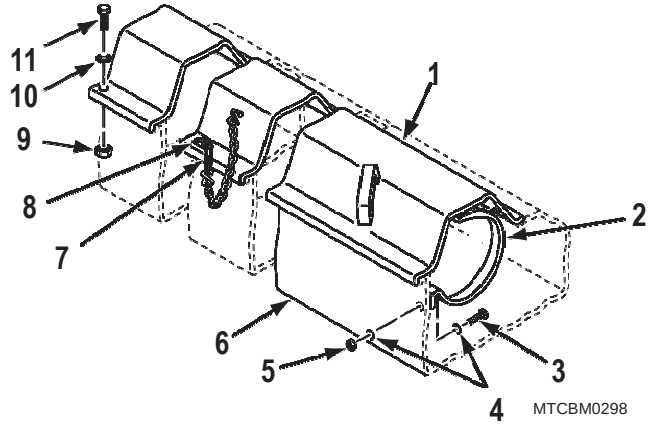


Figure 1. Hose Trough Access Cover Removal.

REMOVAL - Continued

5. Remove two self-locking nuts (Figure 2, Item 5), webbings or wire rope assemblies (Figure 2, Item 4), four washers (Figure 2, Item 2), and two screws (Figure 2, Item 3) from access cover (Figure 2, Item 1). Discard self-locking nuts (Figure 2, Item 5).
6. Remove snap hook (Figure 2, Item 12) and S-hook (Figure 2, Item 11) from chain (Figure 2, Item 10).

END OF TASK

INSTALLATION

1. Install snap hook (Figure 2, Item 12) on chain (Figure 2, Item 10) with S-hook (Figure 2, Item 11).
2. Install two webbings or wire rope assemblies (Figure 2, Item 4) on access cover (Figure 2, Item 1) with two screws (Figure 2, Item 3), four washers (Figure 2, Item 2), and two new self-locking nuts (Figure 2, Item 5).
3. Install access cover (Figure 2, Item 1) on hose trough (Figure 2, Item 9) in open position.
4. Attach two webbings or wire rope assemblies (Figure 2, Item 4) on hose trough (Figure 2, Item 9) with two screws (Figure 2, Item 6), four washers (Figure 2, Item 7), and two new self-locking nuts (Figure 2, Item 8).
5. Close access cover (Figure 2, Item 1) and secure with four screws (Figure 2, Item 16), washers (Figure 2, Item 15), and new self-locking nuts (Figure 2, Item 14).
6. Attach snap hook (Figure 2, Item 12) on hose trough ring (Figure 2, Item 13).

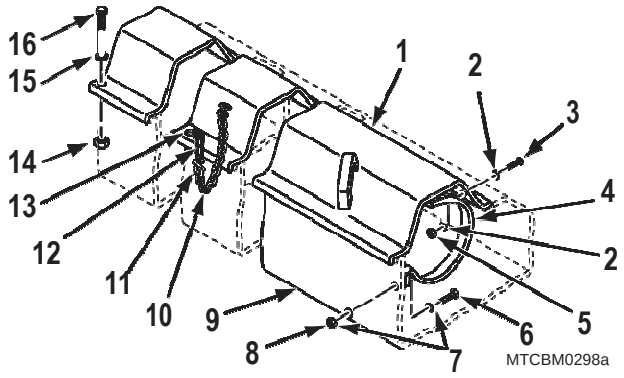


Figure 2. Hose Trough Access Cover Replacement.

END OF TASK

FOLLOW ON TASK

Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FILL GAGE STORAGE TUBE CAP REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Remove cap (Figure 1, Item 2) from fill gage storage tube (Figure 1, Item 1).
2. Remove two S-hooks (Figure 1, Item 3), spring (Figure 1, Item 5), and chain (Figure 1, Item 4) from fill gage storage tube (Figure 1, Item 1) and cap (Figure 1, Item 2).

END OF TASK

INSTALLATION

1. Install chain (Figure 1, Item 4), spring (Figure 1, Item 5), and cap (Figure 1, Item 2) with two S-hooks (Figure 1, Item 3) on fill gage storage tube (Figure 1, Item 1).
2. Install cap (Figure 1, Item 2) in place on fill gage storage tube (Figure 1, Item 1).

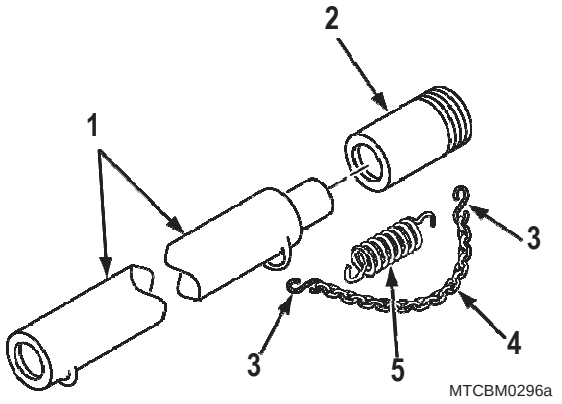


Figure 1. Fill Gage Storage Tube Cap Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
GROUNDING ROD STORAGE TUBE RETAINING PIN REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Remove S-hook (Figure 1, Item 2) and chain (Figure 1, Item 3) from portable grounding rod (Figure 1, Item 1).
2. Remove retaining pin (Figure 1, Item 4) from grounding rod storage tube (Figure 1, Item 5).
3. Remove S-hook (Figure 1, Item 2) from chain (Figure 1, Item 3) and retaining pin (Figure 1, Item 4).

END OF TASK

INSTALLATION

1. Install retaining pin (Figure 1, Item 4) on chain (Figure 1, Item 3) with S-hook (Figure 1, Item 2).
2. Install retaining pin (Figure 1, Item 4) on grounding rod storage tube (Figure 1, Item 5).
3. Install chain (Figure 1, Item 3) on portable grounding rod (Figure 1, Item 1) with S-hook (Figure 1, Item 2).

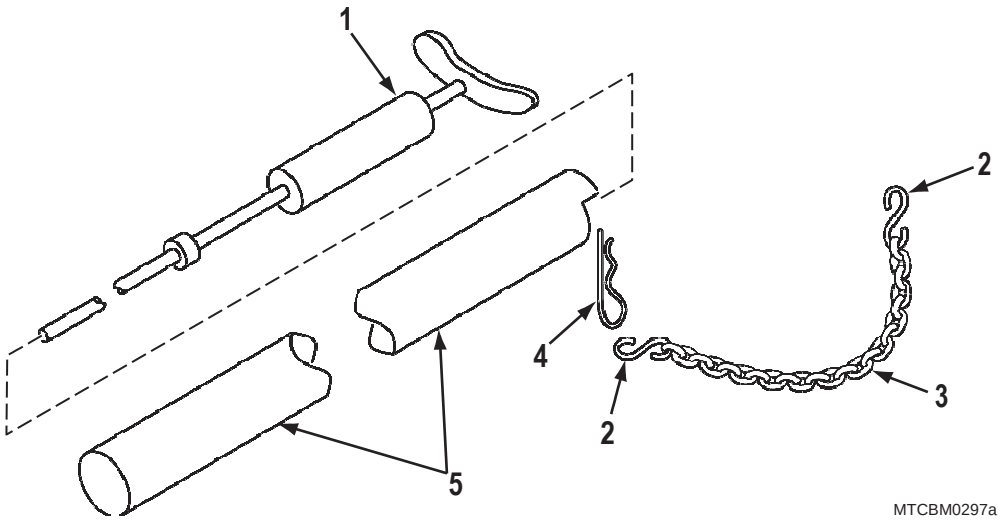


Figure 1. Grounding Rod Storage Tube Retaining Pin Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
1-1/4 IN. HOSE REEL ASSEMBLY REPLACEMENT (M969A1 AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 142)
Seal (WP 0295, Table 1, Item 67)
Washer, Lock
Qty: (2) (WP 0295, Table 1, Item 66)
Washer, Lock

Materials/Parts (cont.)
Qty: (4) (WP 0295, Table 1, Item 139)

Personnel Required
Two

Equipment Condition
Hose reel cabinet removed (WP 0160)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove four screws (Figure 1, Item 4), lockwashers (Figure 1, Item 3), and cover (Figure 1, Item 2) from motor junction box (Figure 1, Item 1). Discard lockwashers (Figure 1, Item 3).

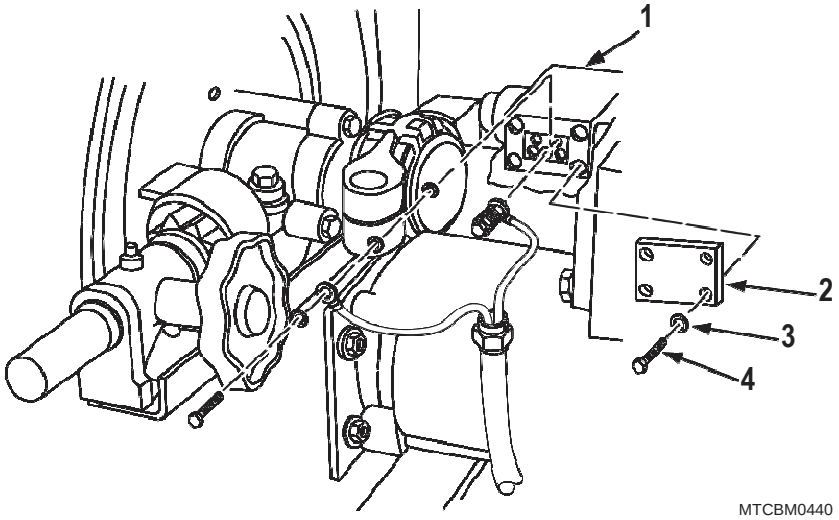


Figure 1. Cover Removal.

REMOVAL - Continued

2. Remove one screw (Figure 2, Item 11), two lockwashers (Figure 2, Item 12), one lockwasher (Figure 2, Item 1), and electrical lead (Figure 2, Item 7) from terminal board (Figure 2, Item 4). Discard lockwasher (Figure 2, Item 1).
3. Remove one screw (Figure 2, Item 11), two nuts (Figure 2, Item 5), two washers (Figure 2, Item 10), one lockwasher (Figure 2, Item 6), and electrical lead (Figure 2, Item 7) from terminal board (Figure 2, Item 4).
4. Remove bushing (Figure 2, Item 8) and conduit (Figure 2, Item 9) with two leads (Figure 2, Item 7) from motor junction box (Figure 2, Item 3).
5. Remove capacitors (Figure 2, Item 2).

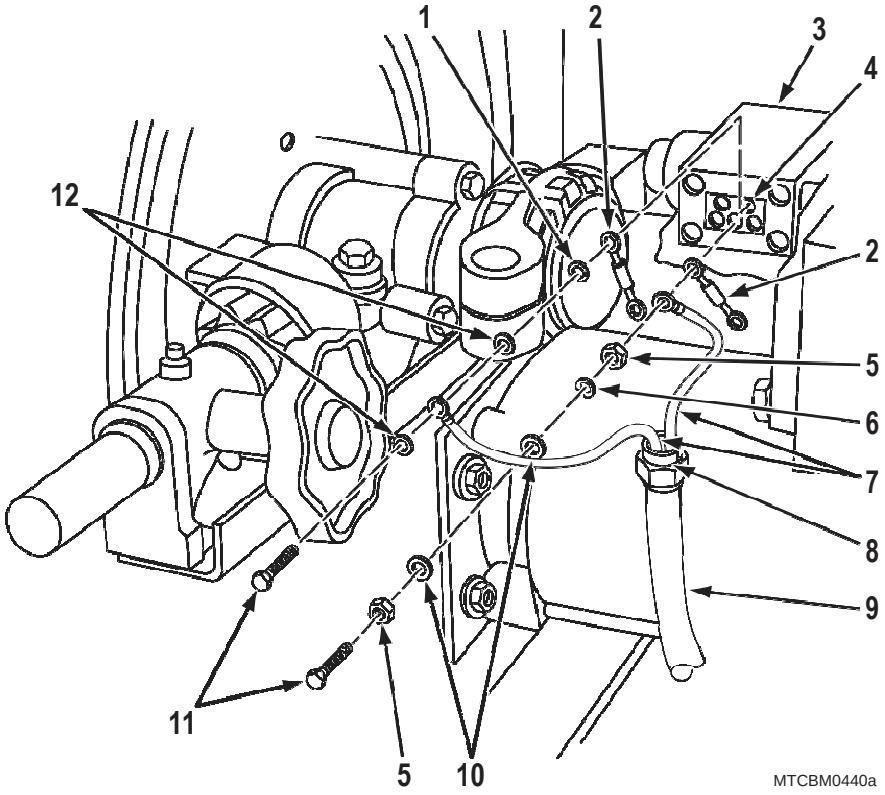


Figure 2. Conduit and Capacitors Removal.

REMOVAL - Continued

6. Remove nuts (Figure 3, Item 4), upper split coupling half (Figure 3, Item 1), seal (Figure 3, Item 2), and lower split coupling half (Figure 3, Item 3) from 1-1/4 in. hose reel (Figure 3, Item 5). Discard seal (Figure 3, Item 2).
7. Remove four mounting screws (Figure 3, Item 8), four self-locking nuts (Figure 3, Item 6), and eight washers (Figure 3, Item 7) from hose reel (Figure 3, Item 5). Discard self-locking nuts (Figure 3, Item 6).
8. With the aid of an assistant, lift hose reel (Figure 3, Item 5) from cabinet.

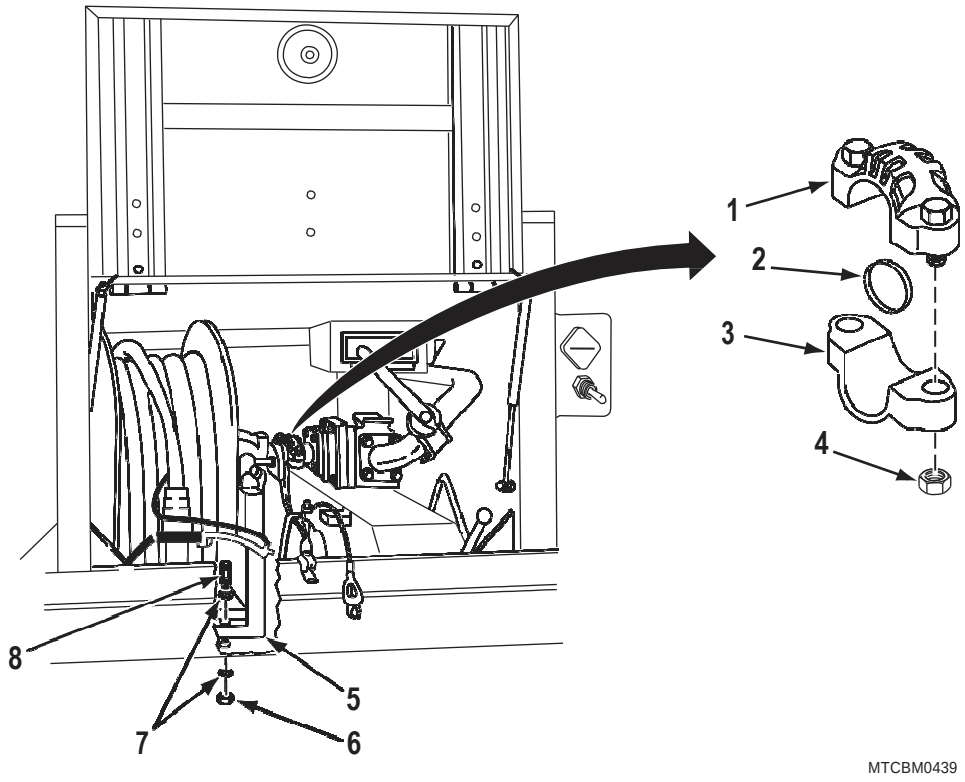


Figure 3. Hose Reel Removal.

END OF TASK

INSTALLATION

1. With the aid of an assistant, lift and position hose reel in cabinet.
2. Install four mounting screws (Figure 4, Item 8), eight washers (Figure 4, Item 7), and four new self-locking nuts (Figure 4, Item 6) on hose reel (Figure 4, Item 5). Torque self-locking nuts between 25-35 lb ft (34-47 N·m).
3. Install new seal (Figure 4, Item 2), lower split coupling half (Figure 4, Item 3), upper split coupling half (Figure 4, Item 1), and two nuts (Figure 4, Item 4) on hose reel (Figure 4, Item 5). Torque nuts (Figure 4, Item 4) between 57-63 lb ft (77-85 N·m).

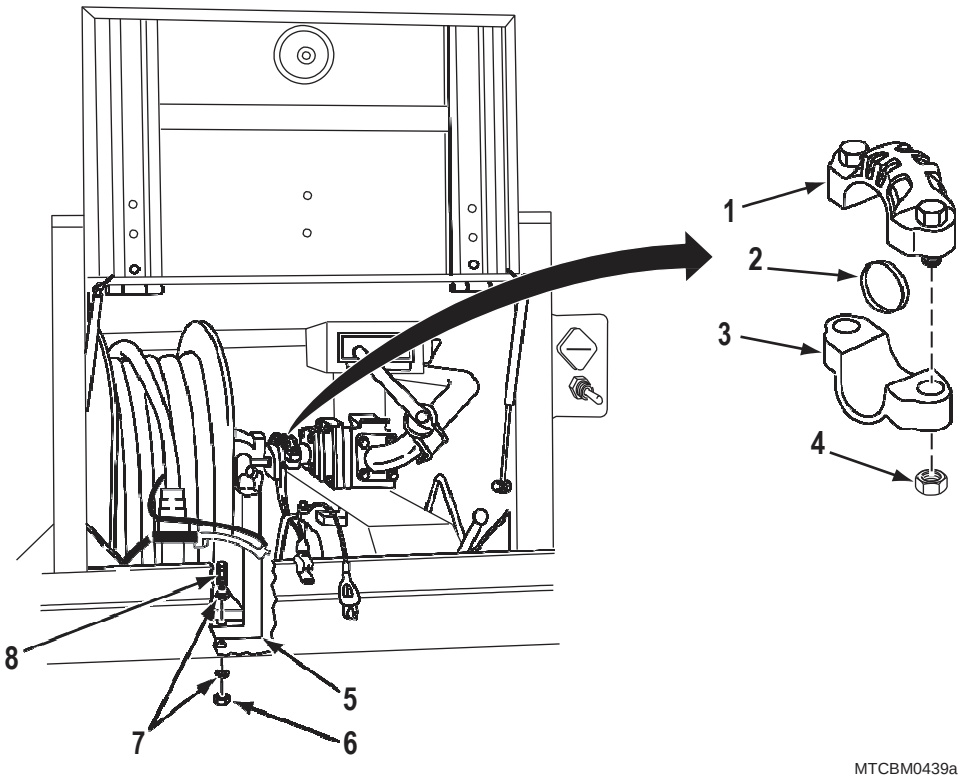


Figure 4. Hose Reel Installation.

INSTALLATION - Continued

4. Install capacitors (Figure 5, Item 2).
5. Thread two leads (Figure 5, Item 7) into motor junction box (Figure 5, Item 3).
6. Connect bushing (Figure 5, Item 8) and conduit (Figure 5, Item 9) to motor junction box (Figure 5, Item 3).
7. Install lead (Figure 5, Item 7) on terminal board (Figure 5, Item 4) with screw (Figure 5, Item 14), two washers (Figure 5, Item 15), and new lockwasher (Figure 5, Item 1).
8. Install lead (Figure 5, Item 7) on terminal board (Figure 5, Item 4) with one screw (Figure 5, Item 14), two washers (Figure 5, Item 13), one lockwasher (Figure 5, Item 6), and two nuts (Figure 5, Item 5).
9. Install cover (Figure 5, Item 10) on motor junction box (Figure 5, Item 3) with four screws (Figure 5, Item 12) and new lockwashers (Figure 5, Item 11).

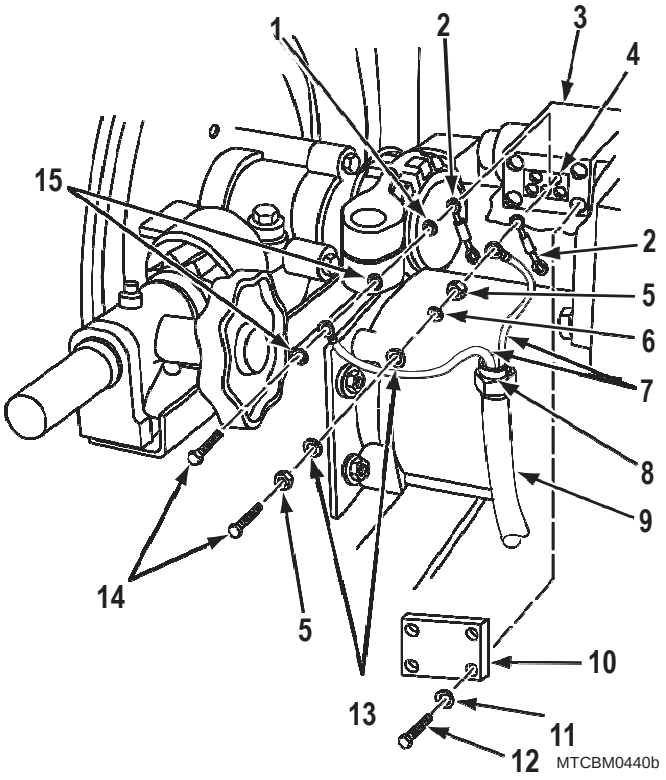


Figure 5. Conduit and Capacitor Installation.

END OF TASK

FOLLOW ON TASK

1. Install hose reel cabinet (WP 0160).
2. Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
1-1/2 IN. HOSE REEL ASSEMBLY REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Hose reel cabinet removed (WP 0160)

Personnel Required
Two

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Remove cover (Figure 1, Item 6) on motor junction box (Figure 1, Item 5).
2. Disconnect electrical leads (Figure 1, Item 3) and conduit (Figure 1, Item 4) from motor junction box (Figure 1, Item 5).
3. Remove split couplings (Figure 1, Item 1) and disconnect hose reel (Figure 1, Item 12) from valve P (Figure 1, Item 2).
4. Remove mounting screws (Figure 1, Item 9), washers (Figure 1, Item 8), and nuts (Figure 1, Item 7).
5. With the aid of an assistant, lift hose reel (Figure 1, Item 12) from cabinet.

END OF TASK

INSTALLATION

1. With the aid of an assistant, lift and position hose reel (Figure 1, Item 12) in cabinet (Figure 1, Item 10).
2. Install mounting screws (Figure 1, Item 9), washers (Figure 1, Item 8), and nuts (Figure 1, Item 7). Torque nuts (Figure 1, Item 7) between 25-35 lb ft (34-47 N·m).
3. Install valve P (Figure 1, Item 11) and two split couplings (Figure 1, Item 1) in place between hose reel and meter (Figure 1, Item 2).
4. Connect electrical leads (Figure 1, Item 3) and conduit (Figure 1, Item 4) to motor junction box (Figure 1, Item 5) as tagged.
5. Install cover (Figure 1, Item 6) on motor junction box (Figure 1, Item 5).

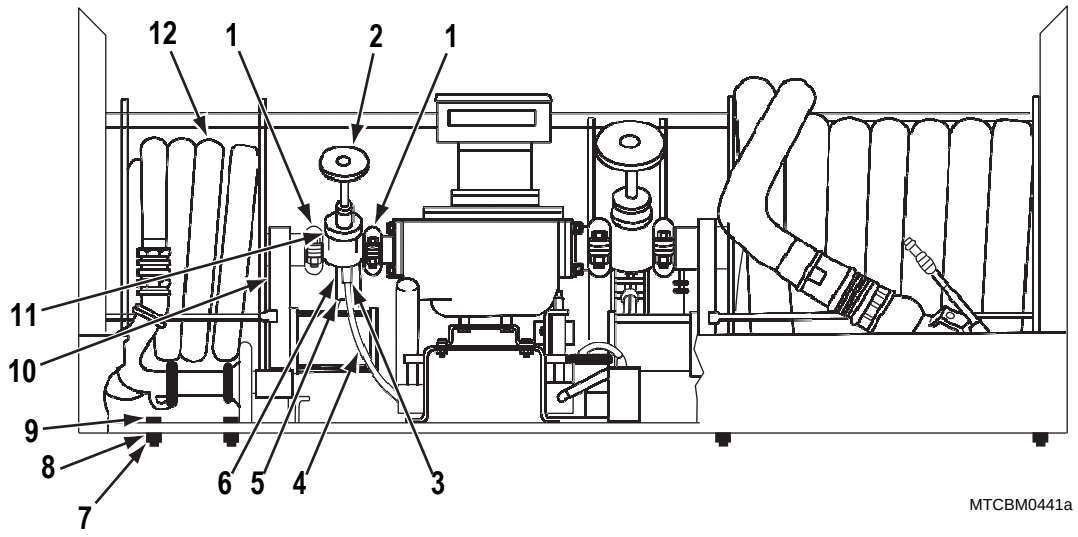


Figure 1. 1-1/2 in. Hose Reel Assembly Installation.

END OF TASK

FOLLOW ON TASK

Install hose reel cabinet (WP 0160).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
1-1/4 IN. AND 1-1/2 IN. HOSE REEL ASSEMBLIES MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Materials/Parts
Cloth, Cleaning (WP 0293, Table 1, Item 5)
O-Ring (WP 0295, Table 1, Item 3)
Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)
Washer, Lock
Qty: (24) (WP 0295, Table 1, Item 139)

Personnel Required
Two

References
WP 0159
WP 0160

Equipment Condition
Hose reel removed (WP 0148) (WP 0149)
Semitrailer uncoupled (WP 0007)

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

DRUM REMOVAL

1. Remove two capscrews (Figure 1, Item 4), flatwashers (Figure 1, Item 3), lockwashers (Figure 1, Item 2), nut (Figure 1, Item 1), pinion bearing assembly (Figure 1, Item 7), and guard (Figure 1, Item 6) from frame (Figure 1, Item 5). Discard lockwashers (Figure 1, Item 2).

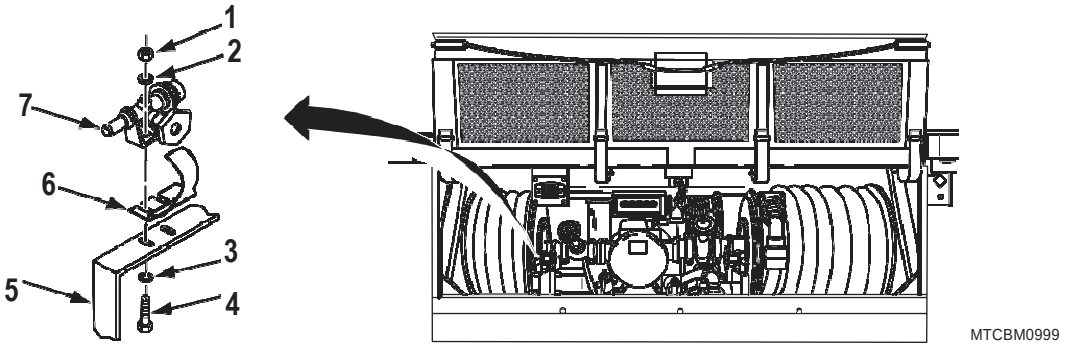


Figure 1. Pinion Bearing Assembly and Guard Removal.

2. Attach lifting device to drum (Figure 2, Item 2) and remove two capscrews (Figure 2, Item 23), flatwashers (Figure 2, Item 22), lockwashers (Figure 2, Item 27), and nuts (Figure 2, Item 28). Discard lockwashers (Figure 2, Item 27).
3. Remove two capscrews (Figure 2, Item 25), flatwashers (Figure 2, Item 26), lockwashers (Figure 2, Item 32), and nuts (Figure 2, Item 33). Discard lockwashers (Figure 2, Item 32).

NOTE

Make sure spacers remain with drum when drum is lifted from frames.

4. Lift drum (Figure 2, Item 2) from frame (Figure 2, Item 24) and place on work surface.
5. Loosen set screw (Figure 2, Item 7). Using a punch, rotate collar clockwise to release collar and bearing (Figure 2, Item 31) from shaft (Figure 2, Item 8).
6. Remove four nuts (Figure 2, Item 30) and flatwashers (Figure 2, Item 29) from disc (Figure 2, Item 1).
7. Remove drum (Figure 2, Item 2).
8. Remove adapter (Figure 2, Item 11) from swing joint (Figure 2, Item 21).
9. Remove four capscrews (Figure 2, Item 3) and lockwashers (Figure 2, Item 4), outlet elbow (Figure 2, Item 5), and O-ring (Figure 2, Item 6). Discard lockwashers (Figure 2, Item 4) and O-ring (Figure 2, Item 6).
10. Remove swing joint (Figure 2, Item 21).
11. Remove six screws (Figure 2, Item 12), lockwashers (Figure 2, Item 13), spacers (Figure 2, Item 15), and ring gear (Figure 2, Item 16). Discard lockwashers (Figure 2, Item 13).
12. Remove four screws (Figure 2, Item 20), nut (Figure 2, Item 9), and flatwashers (Figure 2, Item 10) from disc (Figure 2, Item 14).
13. Remove six capscrews (Figure 2, Item 19), shakeproof washers (Figure 2, Item 18), and bevel gear (Figure 2, Item 17) from disc (Figure 2, Item 1).

DRUM REMOVAL - Continued

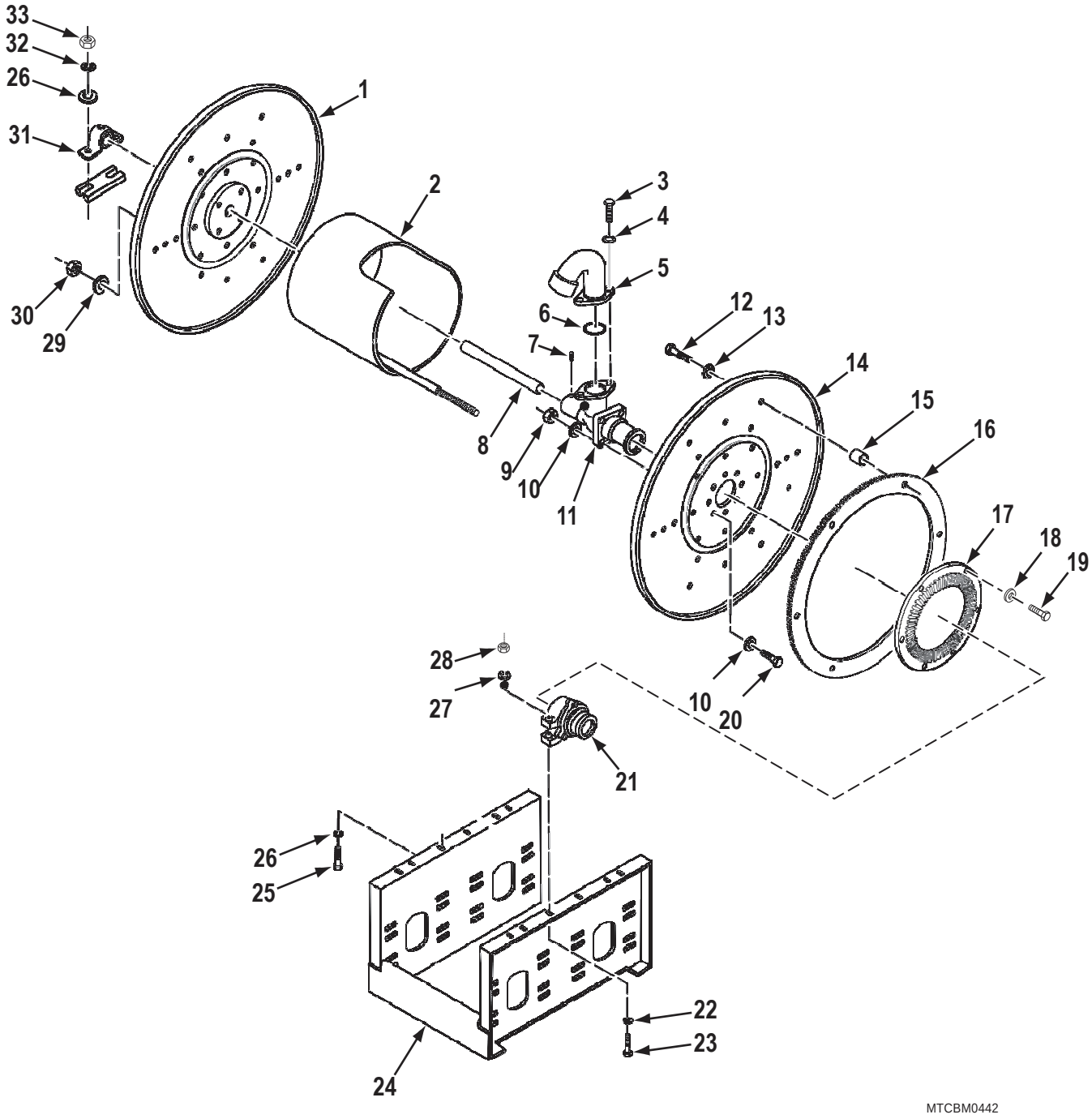


Figure 2. Drum Removal.

END OF TASK

MOTOR REMOVAL

NOTE

- Tag all electrical leads prior to removal for ease of installation.
- Hose reel need not be removed from cabinet to remove motor.

1. Disconnect electrical leads from motor (Figure 3, Item 8) at motor junction box (Figure 3, Item 4). Remove all conduit connections.
2. Disconnect junction box (Figure 3, Item 4) from bushing (Figure 3, Item 5).
3. Disconnect bushing (Figure 3, Item 5) from motor (Figure 3, Item 8).

WARNING

DO NOT remove nipple from motor. Nipple is packed in place with plaster. If nipple is removed, motor will no longer be explosion proof. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

4. Remove four screws (Figure 3, Item 1), flatwashers (Figure 3, Item 2), nuts (Figure 3, Item 7), lockwashers (Figure 3, Item 6), motor (Figure 3, Item 8), and spacer (Figure 3, Item 3) from frame (Figure 3, Item 10).
5. Remove pinion gear (Figure 3, Item 9).

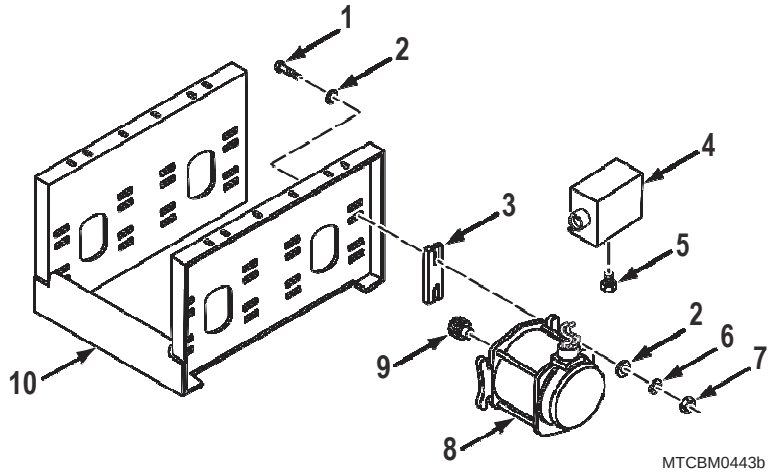


Figure 3. Motor Removal.

END OF TASK

CLEANING. INSPECTION AND REPAIR

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Clean all metal parts with solvent. Dry thoroughly.
2. Inspect gears for worn, damaged, or missing teeth. Replace any damaged gears.

END OF TASK

MOTOR INSTALLATION

NOTE

Be sure gear teeth mesh properly with the ring gear teeth.

1. Install pinion gear (Figure 4, Item 9) on motor (Figure 4, Item 8).
2. Position motor (Figure 4, Item 8) and spacer (Figure 4, Item 3) next to frame (Figure 4, Item 10). Secure with four capscrews (Figure 4, Item 1), flatwashers (Figure 4, Item 2), new lockwashers (Figure 4, Item 6), and nuts (Figure 4, Item 7).
3. Install bushing (Figure 4, Item 5) onto junction box (Figure 4, Item 4).
4. Install junction box (Figure 4, Item 4) onto motor (Figure 4, Item 8).

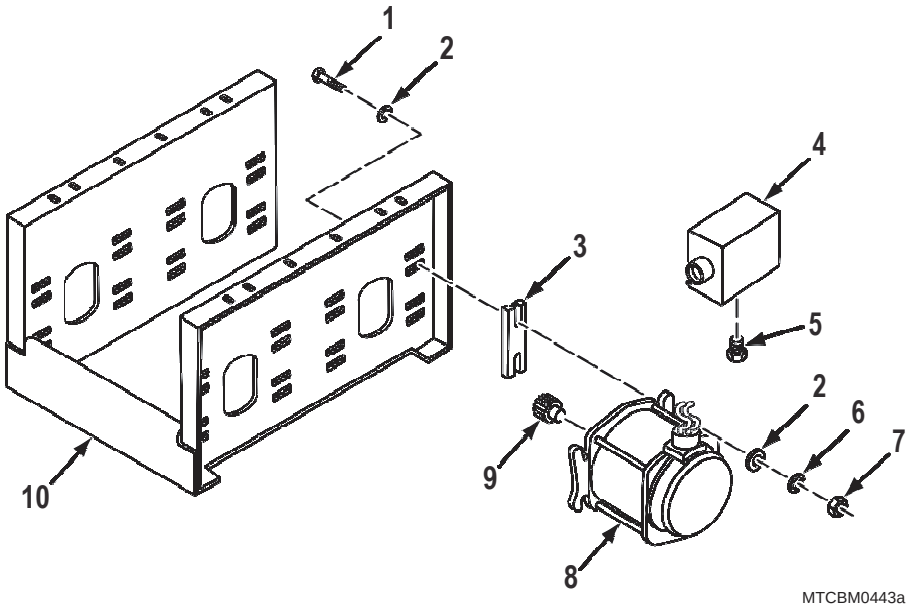


Figure 4. Motor Installation.

END OF TASK

DRUM INSTALLATION

1. Install bevel gear (Figure 5, Item 7), shakeproof washers (Figure 5, Item 8), and six screws (Figure 5, Item 9) on disc (Figure 5, Item 4).
2. Attach ring gear (Figure 5, Item 6) to disc (Figure 5, Item 4), using six spacers (Figure 5, Item 5) between ring gear (Figure 5, Item 6) and disc (Figure 5, Item 4). Secure with six screws (Figure 5, Item 2) and new lockwashers (Figure 5, Item 3).
3. Install swing joint (Figure 5, Item 10).
4. Install new O-ring (Figure 5, Item 12) between adapter elbow (Figure 5, Item 11) and outlet elbow (Figure 5, Item 1).

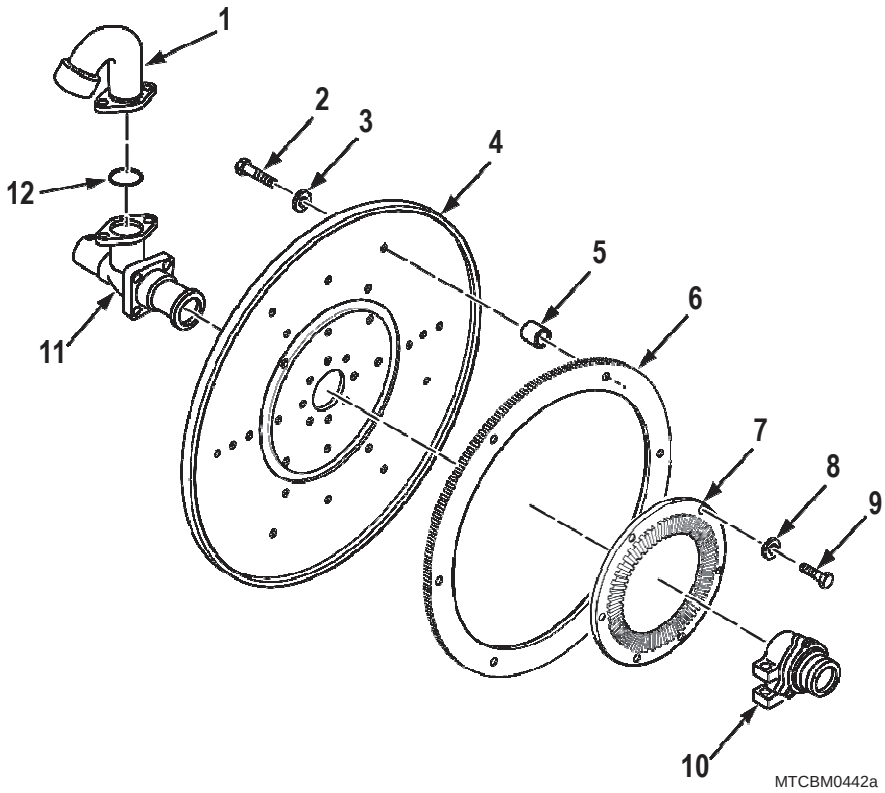


Figure 5. Bevel and Ring Gear Installation.

DRUM INSTALLATION - Continued

5. Secure outlet elbow (Figure 6, Item 6) to adapter elbow (Figure 6, Item 7) with four capscrews (Figure 6, Item 4) and new lockwashers (Figure 6, Item 5).
6. Screw adapter elbow (Figure 6, Item 7) onto swing joint (Figure 6, Item 8).
7. Install axle shaft (Figure 6, Item 3) on adapter elbow (Figure 6, Item 7).
8. Install drum (Figure 6, Item 2).
9. Install disc (Figure 6, Item 1) over axle shaft (Figure 6, Item 3).
10. Install bearing and collar (Figure 6, Item 22) onto axle shaft (Figure 6, Item 3). Lock onto shaft by rotating collar counterclockwise.
11. Attach suitable lifting device to drum (Figure 6, Item 2). Raise drum (Figure 6, Item 2) into position over frame (Figure 6, Item 15).
12. Install spacer between bearing and collar (Figure 6, Item 22) and frame (Figure 6, Item 15).
13. Install two capscrews (Figure 6, Item 16), flatwashers (Figure 6, Item 17), new lockwashers (Figure 6, Item 23), and nuts (Figure 6, Item 24).
14. Install two capscrews (Figure 6, Item 12), flatwashers (Figure 6, Item 11), new lockwashers (Figure 6, Item 10), and nuts (Figure 6, Item 9).

NOTE

Be sure pinion-on-pinion bearing assembly mates properly on bevel gear.

15. Position pinion guard (Figure 6, Item 18) and pinion bearing assembly (Figure 6, Item 19) on frame (Figure 6, Item 15). Secure with two capscrews (Figure 6, Item 13), flatwashers (Figure 6, Item 14), new lockwashers (Figure 6, Item 20), and nut (Figure 6, Item 21).

DRUM INSTALLATION - Continued

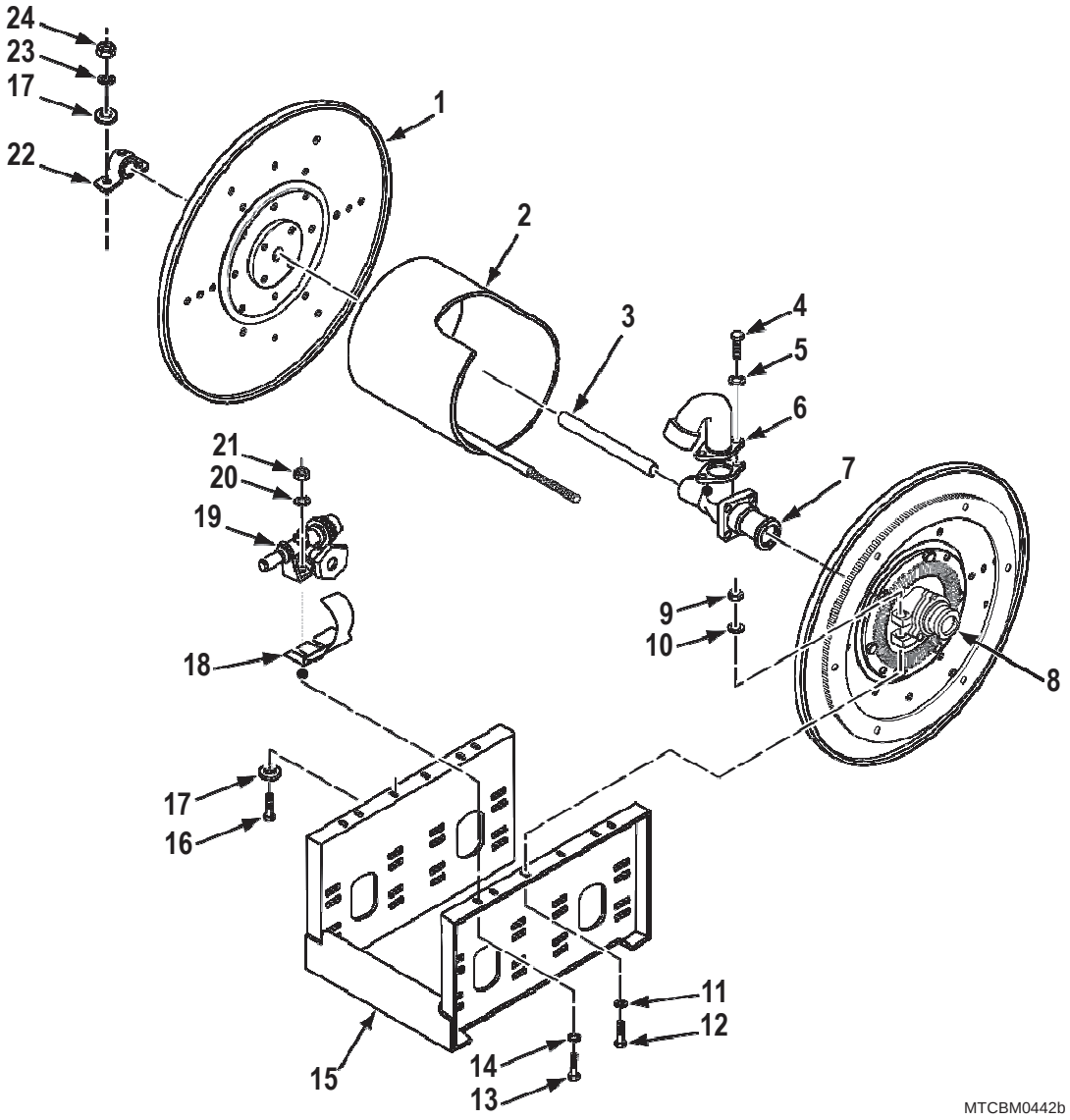


Figure 6. Drum Installation.

END OF TASK

FOLLOW ON TASK

Install hose reel assembly (WP 0148) or (WP 0149).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
2-1/2 IN. HOSE REEL ASSEMBLY REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 27)

Equipment Condition
Hose reel cabinet removed (WP 0159)
Semitrailer uncoupled (WP 0007)

Personnel Required
Two

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

NOTE

The 2-1/2 in. hose reel, hose reel motor, and electrical junction box will be removed as a unit in this procedure.

1. Remove 2-1/2 in. hose (Figure 1, Item 5) from hose reel assembly (Figure 1, Item 4) by releasing quick-disconnect coupling.

CAUTION

Make sure wheels are securely blocked before removing any wedge actuator or lamp band or attempting to release spring brake to prevent semitrailer from moving. Failure to comply may result in damage to, or destruction of, equipment or mission.

2. Remove cover (Figure 1, Item 13) from motor junction box (Figure 1, Item 12).
3. Disconnect leads (Figure 1, Item 14) that enter from the top and bottom of motor junction box (Figure 1, Item 12).
4. Disconnect conduit (Figure 1, Item 15) at top and bottom of motor junction box (Figure 1, Item 12).
5. Remove two split couplings (Figure 1, Item 3) and valve R (Figure 1, Item 2) from hose reel assembly (Figure 1, Item 4) and meter (Figure 1, Item 1).

NOTE

Have a suitable container ready to catch the fuel flow when the pilot fuel flow line is disconnected.

6. Remove pilot fuel flow line (Figure 1, Item 11) from pilot fuel flow connector (Figure 1, Item 10).
7. Remove four mounting screws (Figure 1, Item 7), nuts (Figure 1, Item 9), and washers (Figure 1, Item 8) on bottom of hose reel assembly (Figure 1, Item 4).
8. With the aid of an assistant, lift hose reel assembly (Figure 1, Item 4) from cabinet (Figure 1, Item 6).

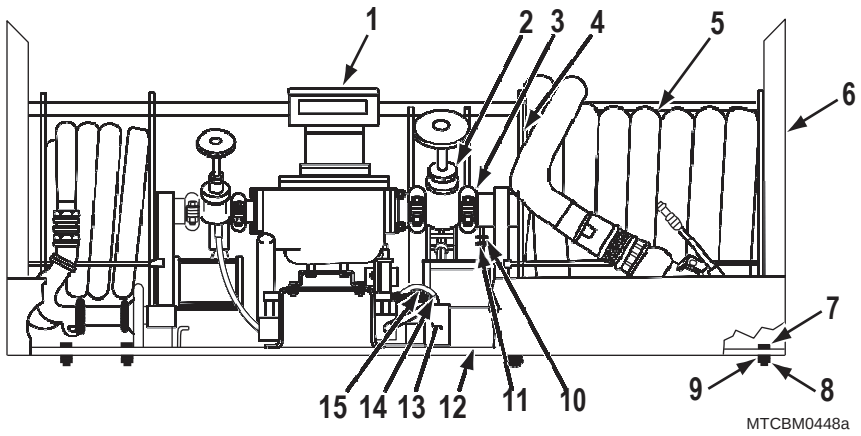


Figure 1. 2-1/2 In. Hose Reel Installation.

END OF TASK

INSTALLATION

1. With the aid of an assistant, lift the hose reel assembly (Figure 1, Item 4) into cabinet (Figure 1, Item 6).
2. Install four mounting screws (Figure 1, Item 7), nuts (Figure 1, Item 9), and washers (Figure 1, Item 8), but do not torque mounting screws.

NOTE

Hose reel will slide slightly from side to side to allow room for valve R.

3. Install valve R (Figure 1, Item 2) and two split couplings (Figure 1, Item 3) in place between hose reel assembly (Figure 1, Item 4) and meter (Figure 1, Item 1).
4. Torque mounting screws (Figure 1, Item 7) and nuts (Figure 1, Item 9) between 240-420 lb in. (27-47 N·m).
5. Connect pilot fuel flow line (Figure 1, Item 11) to pilot fuel flow connector (Figure 1, Item 10).
6. Connect leads (Figure 1, Item 14) and conduit (Figure 1, Item 15) to top and bottom of motor junction box (Figure 1, Item 12) as tagged.
7. Install cover (Figure 1, Item 13) on motor junction box (Figure 1, Item 12).
8. Install hose (Figure 1, Item 5) on hose reel assembly (Figure 1, Item 4).

END OF TASK

FOLLOW ON TASK

Install hose reel cabinet (WP 0159).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
2-1/2 IN. HOSE REEL ASSEMBLY MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Materials/Parts
O-Ring
Qty: (2) (WP 0295, Table 1, Item 3)
Solvent, Cleaning Compound
(WP 0293, Table 1, Item 25)
Washer, Lock

Materials/Parts (cont.)
Qty: (19) (WP 0295, Table 1, Item 49)

Personnel Required
Two

Equipment Condition
Semitrailer uncoupled (WP 0007)
2-1/2 in. hose reel assembly (M970A1) removed
(WP 0151)

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

HOSE REEL REMOVAL AND DISASSEMBLY

1. Remove hand crank (Figure 1, Item 3), from handwind assembly (Figure 1, Item 9).
2. Remove two nuts (Figure 1, Item 1), lockwashers (Figure 1, Item 2), handwind assembly (Figure 1, Item 9), guard (Figure 1, Item 8), spacer (Figure 1, Item 7), flatwashers (Figure 1, Item 6), and screws (Figure 1, Item 5) from frame (Figure 1, Item 4). Discard lockwashers (Figure 1, Item 2).

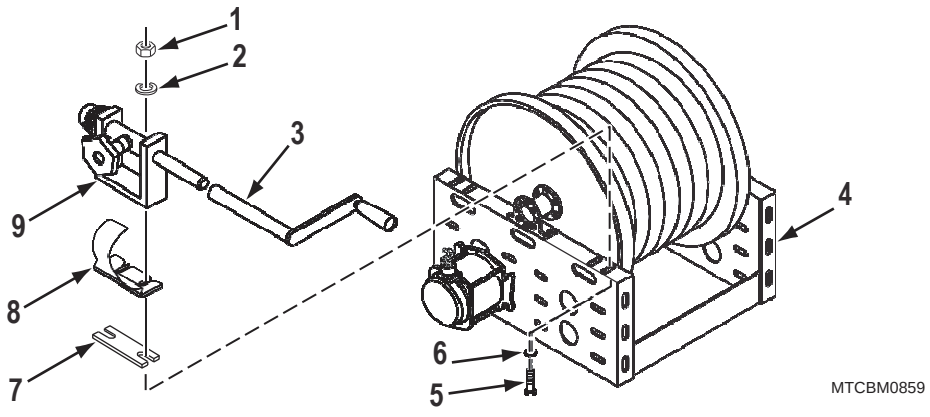


Figure 1. Handwind Assembly and Handle Removal.

HOSE REEL REMOVAL AND DISASSEMBLY - Continued

NOTE

Attach a suitable lifting device to drum assembly prior to removing hardware from frame.

3. Remove four nuts (Figure 2, Item 27), lockwashers (Figure 2, Items 19 and 28), and screws (Figure 2, Item 18). Discard lockwashers (Figure 2, Items 19 and 28).

NOTE

Note order and number of spacers from bearing and collar assembly, for ease of installation.

4. With assistance of helper and suitable lifting device, remove drum assembly (Figure 2, Item 30), and spacers (Figure 2, Item 22 and 23) from frame (Figure 2, Item 26).
5. Remove six screws (Figure 2, Item 35), lockwashers (Figure 2, Item 36), O-ring (Figure 2, Item 37), and swivel joint (Figure 2, Item 34) from adaptor elbow (Figure 2, Item 32). Discard lockwashers (Figure 2, Item 36) and O-ring (Figure 2, Item 37).
6. Separate drum assembly (Figure 2, Item 30), by removing six nuts (Figure 2, Item 42), lockwashers (Figure 2, Item 43), and studs (Figure 2, Item 44), securing disc assembly (Figure 2, Item 40), to six rod spacers (Figure 2, Item 47). Discard lockwashers (Figure 2, Item 43).
7. Remove six screws (Figure 2, Item 33) from bevel gear (Figure 2, Item 38).
8. Remove six screws (Figure 2, Item 46), lockwashers (Figure 2, Item 45), disc (Figure 2, Item 40), and spacers (Figure 2, Item 41) from ring gear (Figure 2, Item 39) and bevel gear (Figure 2, Item 38). Discard lockwashers (Figure 2, Item 45).
9. Remove screw (Figure 2, Item 31), lockwasher (Figure 2, Item 10), nut (Figure 2, Item 9), and adapter elbow (Figure 2, Item 32), from axle shaft (Figure 2, Item 29).
10. Remove drum (Figure 2, Item 30).
11. Remove four screws (Figure 2, Item 1), lockwashers (Figure 2, Item 2), O-ring (Figure 2, Item 3), and outlet elbow (Figure 2, Item 4), from adapter elbow (Figure 2, Item 32). Discard O-ring (Figure 2, Item 3) and lockwashers (Figure 2, Item 2).
12. Remove four screws (Figure 2, Item 8), lockwashers (Figure 2, Item 7), O-ring (Figure 2, Item 5), and outlet adapter (Figure 2, Item 6), from outlet elbow (Figure 2, Item 4). Discard O-ring (Figure 2, Item 5) and lockwashers (Figure 2, Item 7).
13. Remove six screws (Figure 2, Item 17), lockwashers (Figure 2, Item 13), nuts (Figure 2, Item 12), from collar (Figure 2, Item 24), disc (Figure 2, Item 25), and axle shaft (Figure 2, Item 29). Discard lockwashers (Figure 2, Item 13).
14. Remove set screw (Figure 2, Item 21) and separate axle shaft (Figure 2, Item 29) from bearing (Figure 2, Item 20) and collar (Figure 2, Item 24).

NOTE

Take note of how many thrust washers, if any, are used between spacers and disc.

15. Remove nuts (Figure 2, Item 16), lockwashers (Figure 2, Item 15), studs (Figure 2, Item 14), and thrust washers (Figure 2, Item 11) from disc (Figure 2, Item 25) and rod spacers (Figure 2, Item 47). Discard lockwashers (Figure 2, Item 15).

HOSE REEL REMOVAL AND DISASSEMBLY - Continued

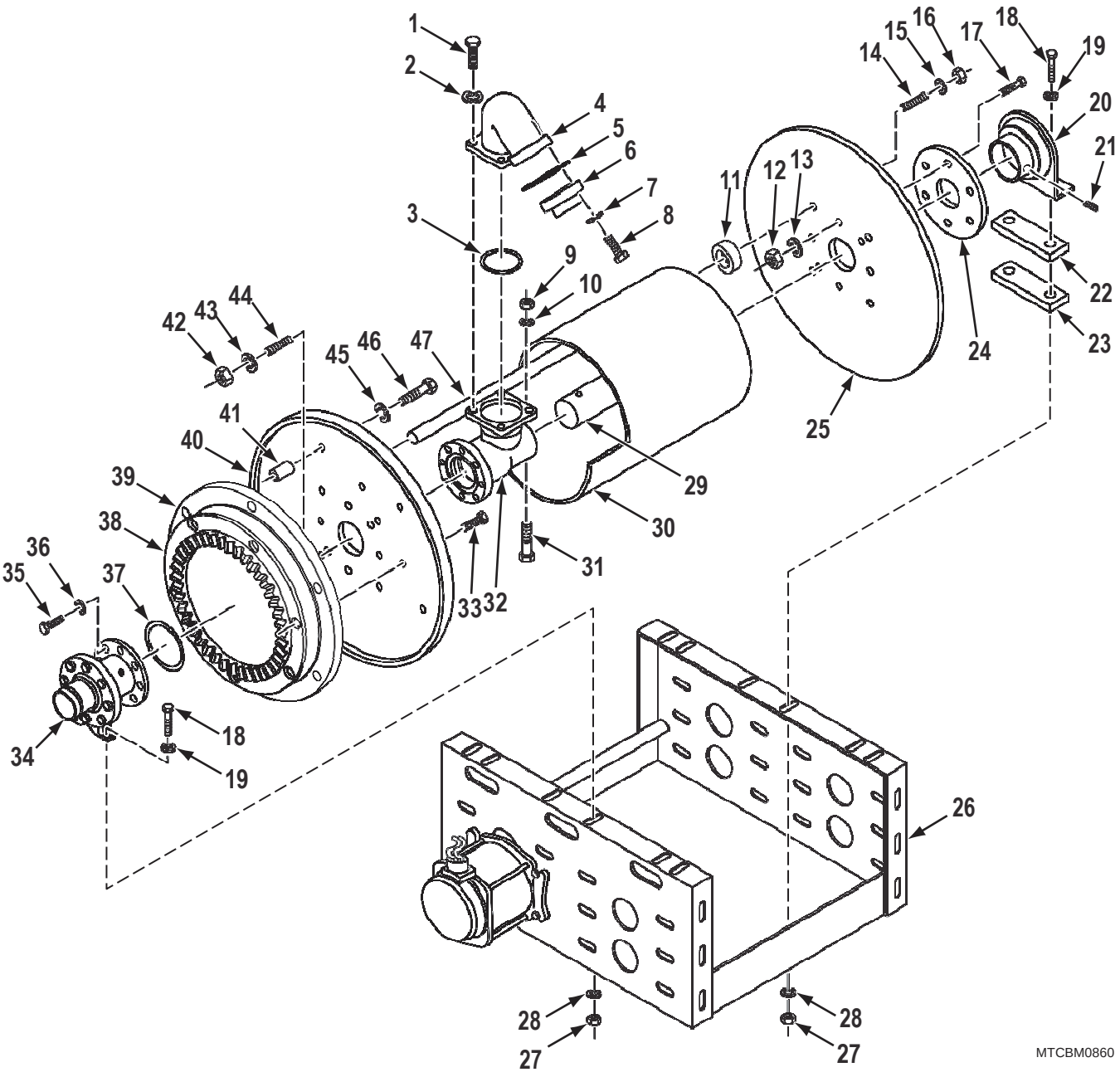


Figure 2. Hose Reel Removal and Disassembly.

END OF TASK

MOTOR REMOVAL

WARNING

DO NOT remove nipple from motor. Nipple is packed in place with plaster. If nipple is removed, motor will no longer be explosion proof. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

It is not necessary to remove hose reel assembly from cabinet to remove motor.

1. Remove four screws (Figure 3, Item 2), eight flatwashers (Figure 3, Item 1), lockwashers (Figure 3, Item 8), nuts (Figure 3, Item 7), and motor (Figure 3, Item 6) from frame (Figure 3, Item 3). Discard lockwashers (Figure 3, Item 8).
2. Remove set screw (Figure 3, Item 4) and pinion gear (Figure 3, Item 5) from motor (Figure 3, Item 6).

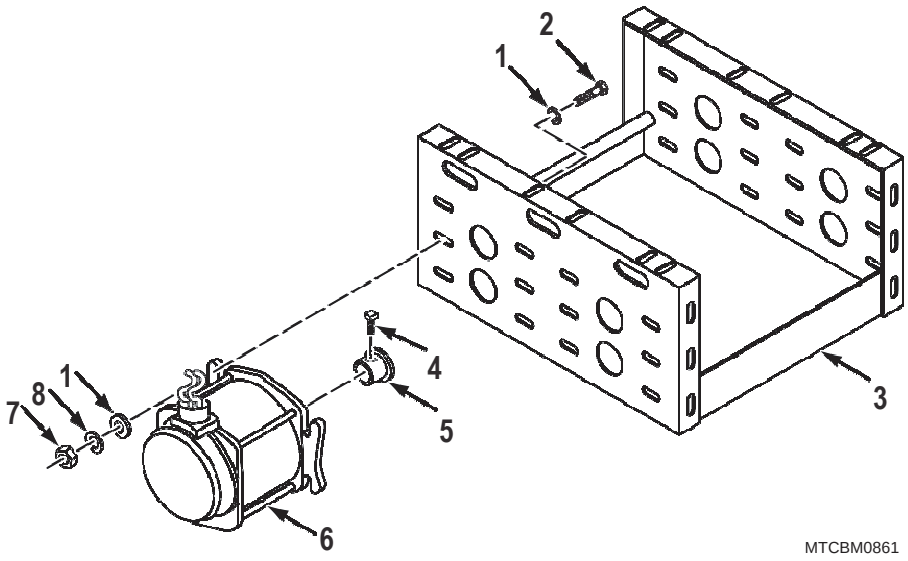


Figure 3. Motor Removal.

END OF TASK

CLEANING, INSPECTION AND REPAIR

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Clean all metal parts with solvent. Dry thoroughly.
2. Inspect gears for worn, damaged, or missing teeth. Replace any damaged gears.

END OF TASK

MOTOR INSTALLATION

NOTE

Be sure gear teeth mesh properly with the ring gear teeth.

1. Install pinion gear (Figure 4, Item 30) to motor (Figure 4, Item 29) with set screw (Figure 4, Item 31).
2. Install motor (Figure 4, Item 29) to frame (Figure 4, Item 26) with four nuts (Figure 4, Item 32), new lockwashers (Figure 4, Item 33), eight washers (Figure 4, Item 34), and four screws (Figure 4, Item 35).

END OF TASK

HOSE REEL ASSEMBLY AND INSTALLATION

NOTE

Take note of how many thrust washers, if any, are used between spacers and disc.

1. Install rod spacers (Figure 4, Item 54) to disc (Figure 4, Item 25) with thrust washers (Figure 4, Item 11), studs (Figure 4, Item 14), new lockwashers (Figure 4, Item 15), and nuts (Figure 4, Item 16).
2. Install axle shaft (Figure 4, Item 36) to bearing (Figure 4, Item 20) and collar (Figure 4, Item 24) with set screw (Figure 4, Item 21).
3. Install collar (Figure 4, Item 24) and disc (Figure 4, Item 25) to axle shaft (Figure 4, Item 36) and bearing (Figure 4, Item 20) and collar (Figure 4, Item 24) with six screws (Figure 4, Item 17), new lockwashers (Figure 4, Item 13), and nuts (Figure 4, Item 12).
4. Install outlet adapter (Figure 4, Item 6) to outlet elbow (Figure 4, Item 4) with four screws (Figure 4, Item 8), new lockwashers (Figure 4, Item 7), and new O-ring (Figure 4, Item 5).
5. Install outlet elbow (Figure 4, Item 4) to adapter elbow (Figure 4, Item 39) with four screws (Figure 4, Item 1), new lockwashers (Figure 4, Item 2), and new O-ring (Figure 4, Item 3).
6. Install adapter elbow (Figure 4, Item 39) to axle shaft (Figure 4, Item 36) with one screw (Figure 4, Item 38), new lockwasher (Figure 4, Item 10), and nut (Figure 4, Item 9).
7. Install disc (Figure 4, Item 47) and spacers (Figure 4, Item 48) to ring gear (Figure 4, Item 46) and bevel gear (Figure 4, Item 45) with six screws (Figure 4, Item 53) and new lockwashers (Figure 4, Item 52).
8. Secure bevel gear (Figure 4, Item 45) with six screws (Figure 4, Item 40) to ring gear (Figure 4, Item 46) and disc assembly (Figure 4, Item 47).
9. Install drum assembly (Figure 4, Item 37).
10. Secure disc assembly (Figure 4, Item 47) to six rod spacers (Figure 4, Item 54) and drum assembly (Figure 4, Item 37) with six nuts (Figure 4, Item 49), new lockwashers (Figure 4, Item 50), and studs (Figure 4, Item 51).
11. Install swivel joint (Figure 4, Item 41) to adaptor elbow (Figure 4, Item 39) with six screws (Figure 4, Item 42), new lockwashers (Figure 4, Item 43), and new O-ring (Figure 4, Item 44).

NOTE

Install with the same order and number of spacers as noted on removal.

12. With assistance of helper and suitable lifting device, install drum assembly (Figure 4, Item 37) and spacers (Figure 4, Items 22 and 23) to frame (Figure 4, Item 26).
13. Secure drum assembly (Figure 4, Item 37) with four nuts (Figure 4, Item 27), new lockwashers (Figure 4, Item 28), new lockwashers (Figure 4, Item 19), and screws (Figure 4, Item 18).

HOSE REEL ASSEMBLY AND INSTALLATION - Continued

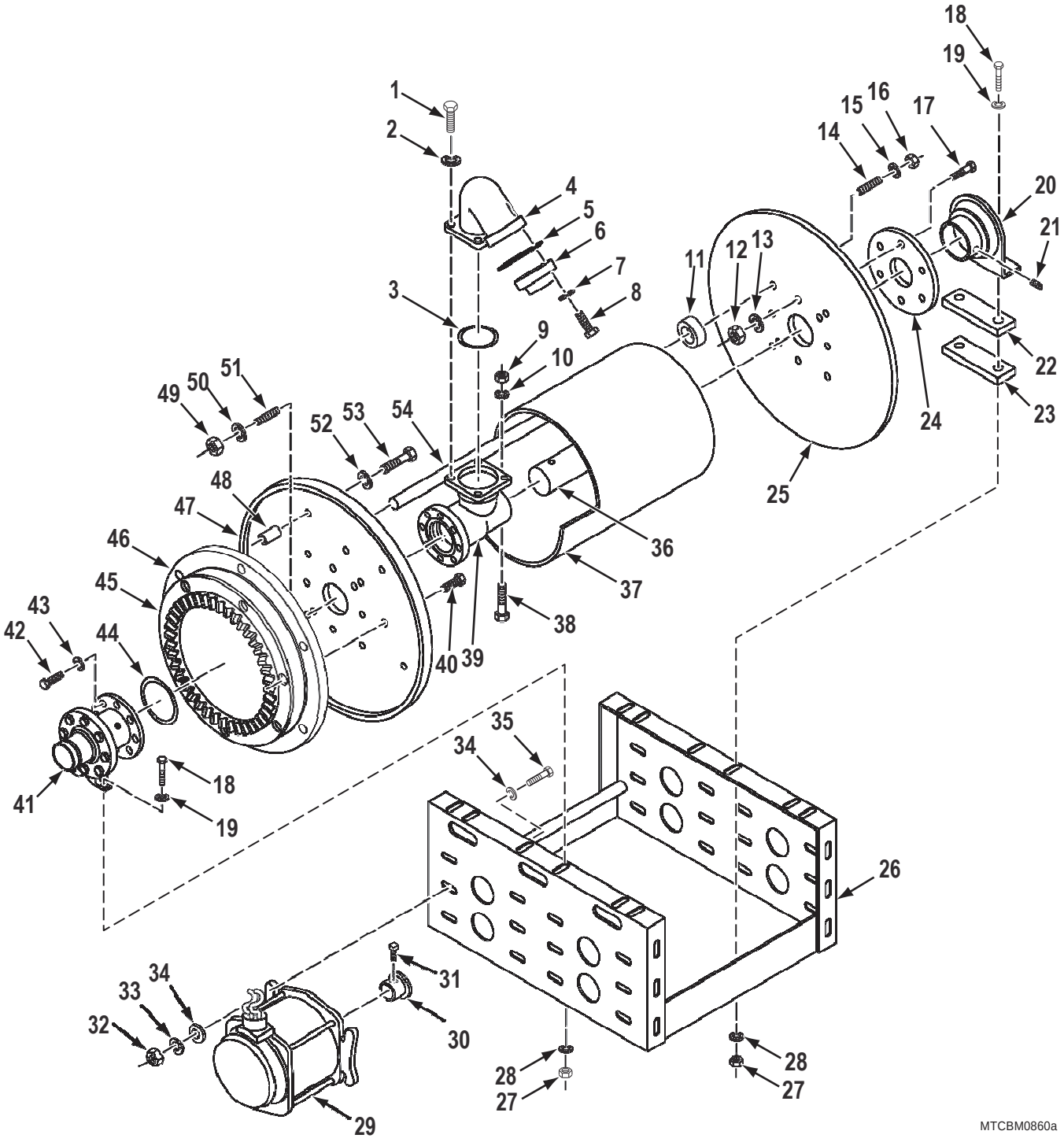


Figure 4. Hose Reel Assembly and Installation.

HOSE REEL ASSEMBLY AND INSTALLATION - Continued

14. Install handwind assembly (Figure 5, Item 9), guard (Figure 5, Item 8), and spacer (Figure 5, Item 7) to frame (Figure 5, Item 4) with two nuts (Figure 5, Item 1), new lockwashers (Figure 5, Item 2), flatwashers (Figure 5, Item 6), and screws (Figure 5, Item 5).
15. Install crank (Figure 5, Item 3) to handwind assembly (Figure 5, Item 9).

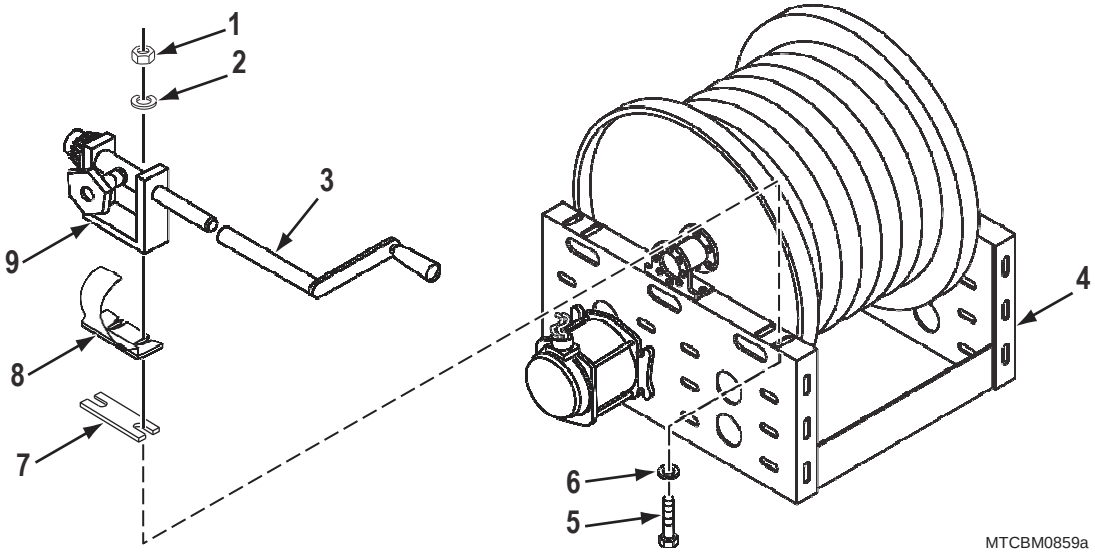


Figure 5. Handwind Assembly and Handle Installation.

END OF TASK

FOLLOW ON TASK

Install 2-1/2 in. hose reel assembly (M970A1) (WP 0151).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
2-1/2 IN. HOSE COUPLING MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
O-Ring Qty: (2) (WP 0295, Table 1, Item 185)
Packing, Preformed

Materials/Parts (cont.)
(WP 0295, Table 1, Item 138)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

Remove nozzle and coupling.

END OF TASK

DISASSEMBLY

1. Set sleeves (Figure 1, Items 1 and 2) in disconnected position.
2. Remove ring (Figure 1, Item 3).
3. Remove sleeve assembly (Figure 1, Item 2).

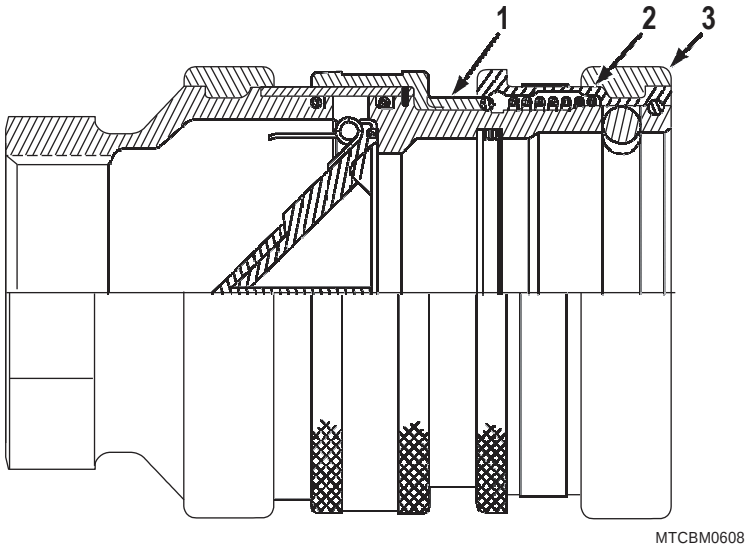


Figure 1. 2-1/2 In. Hose Coupling Disassembly.

DISASSEMBLY - Continued

4. Remove bumper (Figure 2, Item 14) from sleeve assembly (Figure 2, Item 11).
5. Remove spring (Figure 2, Item 10).
6. Remove three retainers (Figure 2, Item 12).
7. Remove lock sleeve (Figure 2, Item 7).
8. Remove eight balls (Figure 2, Item 16) from lock sleeve (Figure 2, Item 7).
9. Remove O-ring (Figure 2, Item 8) securing sleeve (Figure 2, Item 6) to body (Figure 2, Item 2). Discard O-ring (Figure 2, Item 8).
10. Slide sleeve (Figure 2, Item 6) off body (Figure 2, Item 2).
11. Remove two packings (Figure 2, Item 3) from body. Discard packings (Figure 2, Item 3).
12. Remove two pins (Figure 2, Item 5) securing two springs (Figure 2, Item 4) to two valve assemblies (Figure 2, Item 15).
13. Remove two springs (Figure 2, Item 4) and valve assemblies (Figure 2, Item 15).
14. Remove bumper (Figure 2, Item 1) and packing (Figure 2, Item 9) from body (Figure 2, Item 2).

END OF TASK

ASSEMBLY

1. Install packing (Figure 2, Item 9) and bumper (Figure 2, Item 1) on body (Figure 2, Item 2).
2. Install valve assemblies (Figure 2, Item 15) into body. Using round nose pliers, move springs (Figure 2, Item 4) into position from outside of valve. Align holes and install two pins (Figure 2, Item 5).
3. Install two new packings (Figure 2, Item 3) to body (Figure 2, Item 2).
4. Slide sleeve (Figure 2, Item 6) onto body and secure with new O-ring (Figure 2, Item 8).
5. Install eight balls (Figure 2, Item 16) into lock sleeve (Figure 2, Item 6) and then install lock sleeve (Figure 2, Item 8) onto body (Figure 2, Item 2).
6. Install three retainers (Figure 2, Item 12) into body (Figure 2, Item 2).
7. Install spring (Figure 2, Item 10).
8. Install bumper (Figure 2, Item 14) on sleeve assembly (Figure 2, Item 11) and then install sleeve on body (Figure 2, Item 2).
9. Install ring (Figure 2, Item 13).

ASSEMBLY - Continued

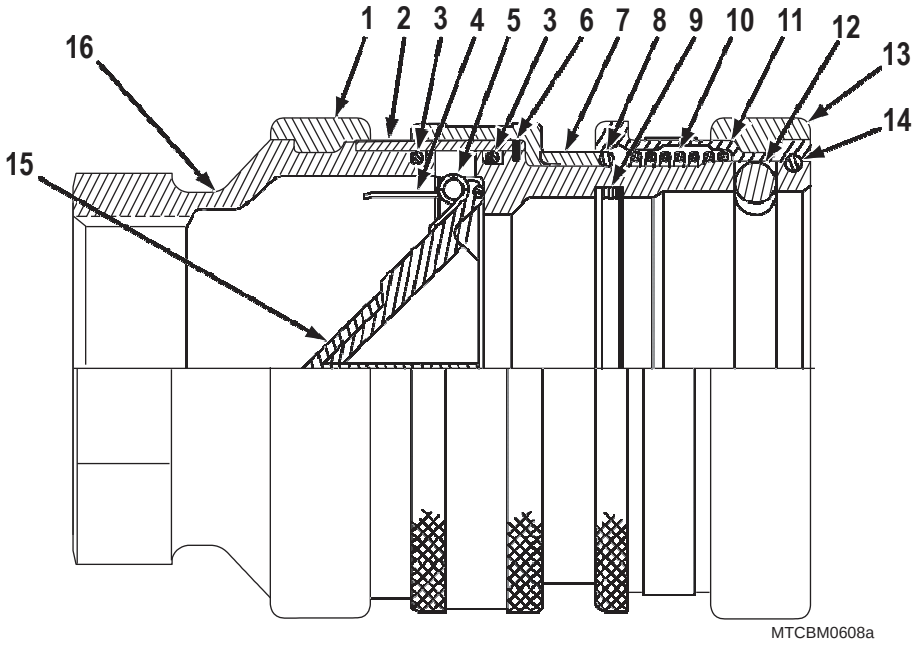


Figure 2. 2-1/2 In. Hose Coupling Maintenance.

END OF TASK

INSTALLATION

Install nozzle and coupling.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
DEADMAN RELEASE VALVE ASSEMBLY REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

References
WP 0285

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Tag hoses prior to removal for ease of installation.

REMOVAL

1. Loosen jamnut (Figure 1, Item 2) and remove deadman release valve (Figure 1, Item 5) from bracket (Figure 1, Item 1).
2. Disconnect two hoses (Figure 1, Item 3) from elbows (Figure 1, Item 4).
3. Remove two elbows (Figure 1, Item 4) from deadman release valve (Figure 1, Item 5).

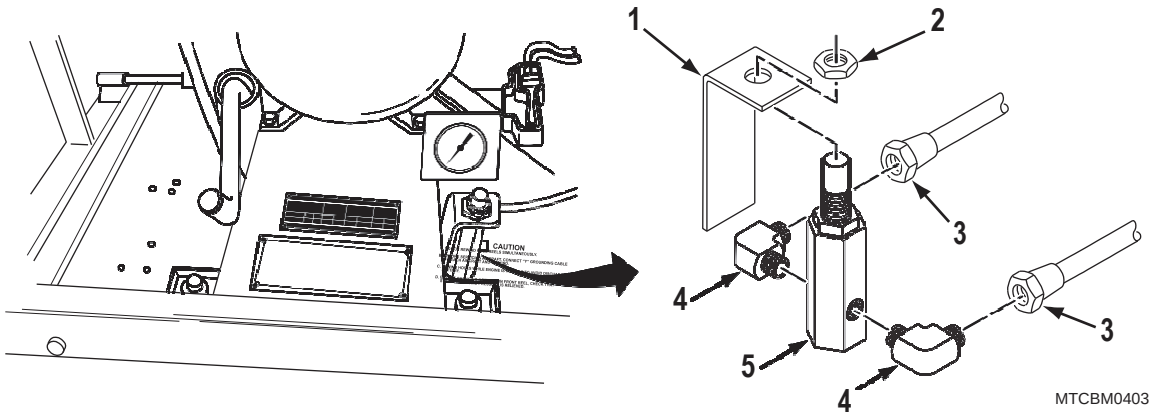


Figure 1. Deadman Release Valve Removal.

END OF TASK

INSPECTION

Inspect hoses for damage. Replace if damaged (WP 0285).

END OF TASK

INSTALLATION

NOTE

Position elbow fittings as previously noted.

1. Install two elbows (Figure 2, Item 4) on deadman release valve (Figure 2, Item 5).
2. Connect two hoses (Figure 2, Item 3) to elbows (Figure 2, Item 4).
3. Position deadman release valve (Figure 2, Item 5) on bracket (Figure 2, Item 1) and tighten jamnut (Figure 2, Item 2).

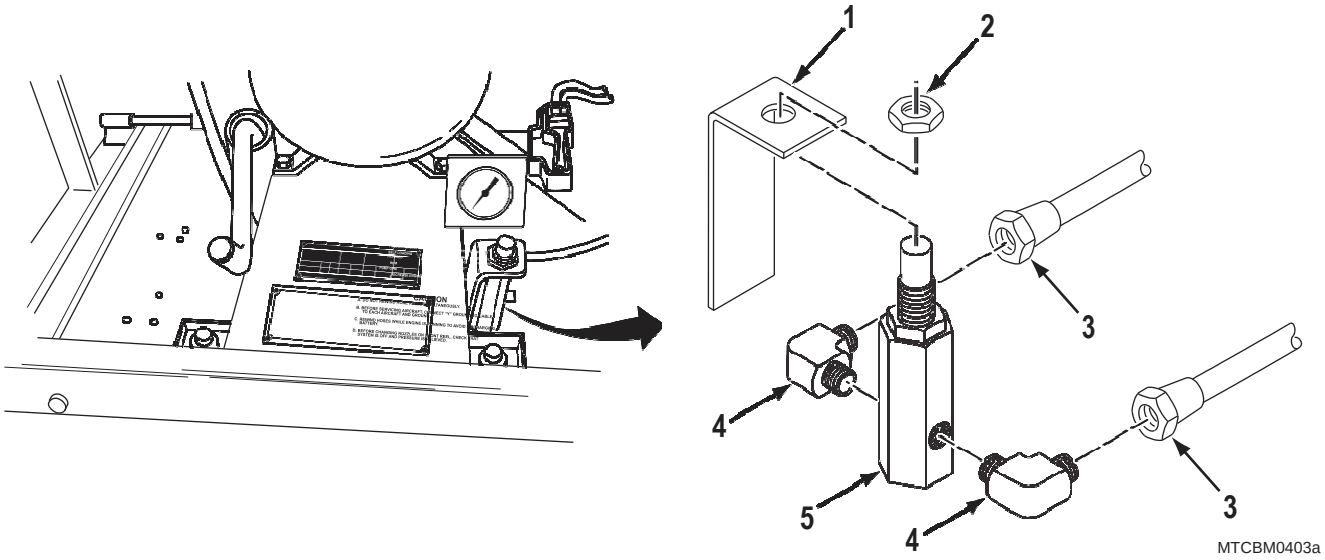


Figure 2. Deadman Release Valve Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
DEADMAN HOSE REEL ASSEMBLY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 166)

Personnel Required
Two

Equipment Condition
Valve R assembly removed (WP 0280)
Volumetric meter assembly removed (WP 0244)

REMOVAL

1. Deactivate deadman system per instructions on plate inside hose reel cabinet.
2. Remove two elbow assemblies (Figure 1, Items 2 and 7) from hose reel assembly (Figure 1, Item 1).
3. Disconnect air lines from ports on both sides of hose reel assembly.
4. Remove four mounting screws (Figure 1, Item 6), washers (Figure 1, Item 5), and self-locking nuts (Figure 1, Item 4) from base of hose reel assembly (Figure 1, Item 3). Discard self-locking nuts (Figure 1, Item 4).

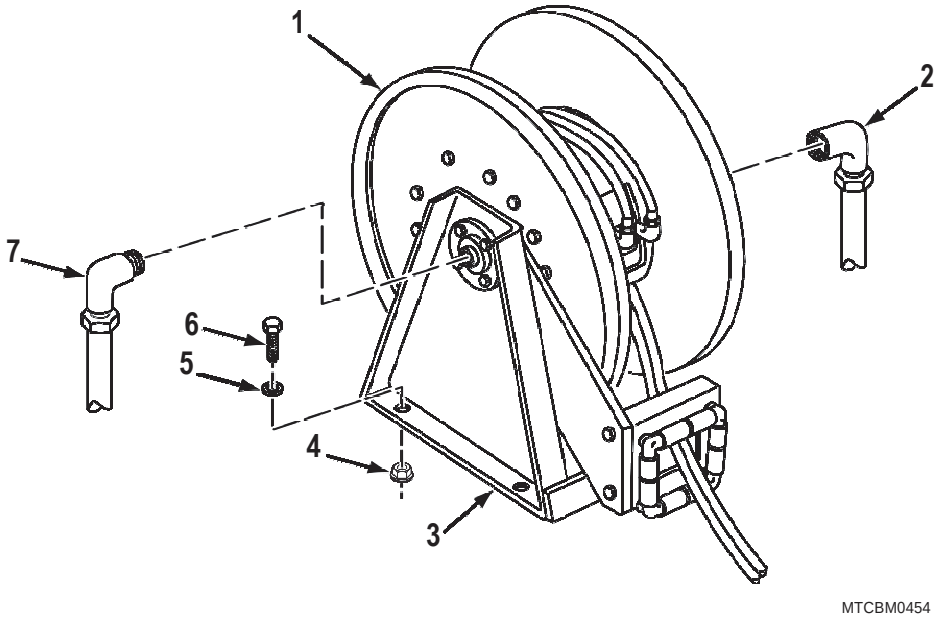


Figure 1. Deadman Hose Reel Assembly Removal.

REMOVAL - Continued

5. Using a suitable lifting device and an assistant, remove hose reel assembly (Figure 2, Item 1) from base of hose reel assembly (Figure 2, Item 3).

END OF TASK

INSTALLATION

1. Using a suitable lifting device and an assistant, position hose reel assembly (Figure 2, Item 1) in place on base of hose reel assembly (Figure 2, Item 3).

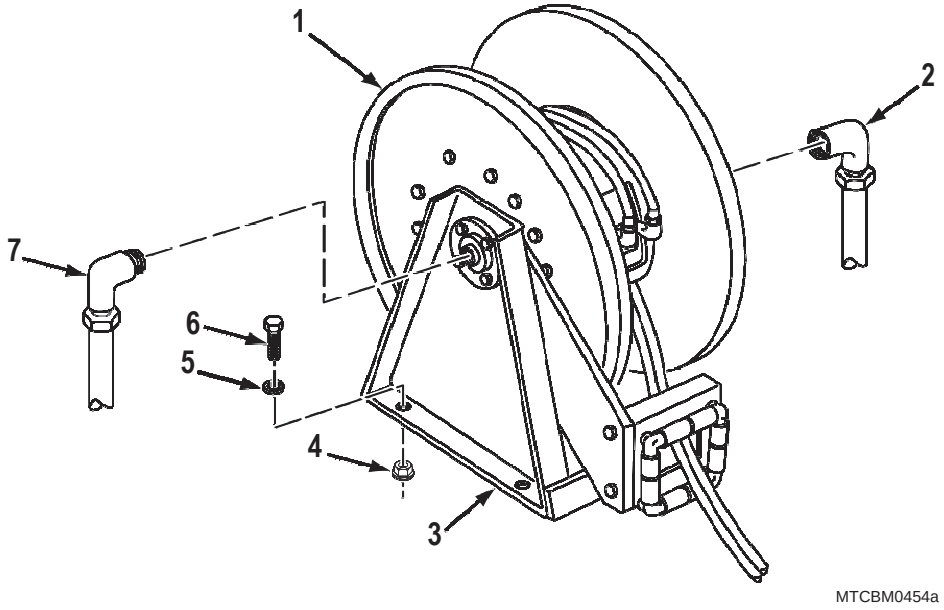


Figure 2. Deadman Hose Reel Assembly Installation.

2. Install four mounting screws (Figure 2, Item 6), washers (Figure 2, Item 5), and new self-locking nuts (Figure 2, Item 4). Torque mounting nuts between 25-35 lb ft (34-47 N·m).
3. Install two elbow assemblies (Figure 2, Items 2 and 7) to hose reel assembly (Figure 2, Item 1).
4. Connect air lines to ports on both sides of hose reel assembly (Figure 2, Item 1).

END OF TASK

FOLLOW ON TASK

1. Install valve R assembly (WP 0280).
2. Install volumetric meter assembly (WP 0244).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
DEADMAN CONTROL HANDLE ASSEMBLY MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (2) (WP 0295, Table 1, Item 175)
Pin, Spring (WP 0295, Table 1, Item 170)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Semitrailer bonded and grounded (WP 0008)

DISASSEMBLY

1. Pull hose reel hoses out far enough to remove deadman control.
2. Remove two screws (Figure 1, Item 1) and self-locking nuts (Figure 1, Item 2). Discard self-locking nuts (Figure 1, Item 2).
3. Disconnect green hose (Figure 1, Item 3) and red hose (Figure 1, Item 4). Remove valve (Figure 1, Item 6).
4. Drive out roll pin (Figure 1, Item 5) and remove lever (Figure 1, Item 7) and handle guard (Figure 1, Item 8). Discard roll pin (Figure 1, Item 5).

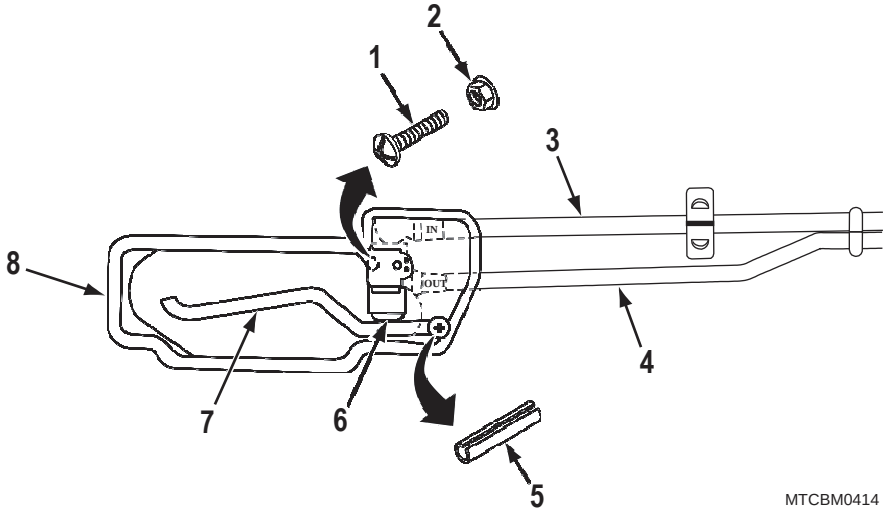


Figure 1. Deadman Control Handle Assembly Removal.

END OF TASK

INSPECTION

Inspect parts for damage. Replace any defective parts.

END OF TASK

ASSEMBLY

1. Align holes in lever (Figure 2, Item 7) and handle guard (Figure 2, Item 8). Drive in new roll pin (Figure 2, Item 5).
2. Thread red hose (Figure 2, Item 4) through opening in handle guard (Figure 2, Item 8) and attach to OUT port of valve (Figure 2, Item 6).
3. Attach green hose (Figure 2, Item 3) to IN port of valve (Figure 2, Item 6).
4. Position valve (Figure 2, Item 6) and secure with two screws (Figure 2, Item 1) and new self-locking nuts (Figure 2, Item 2).
5. Pull hoses to release latch on hose reel and rewind hoses.

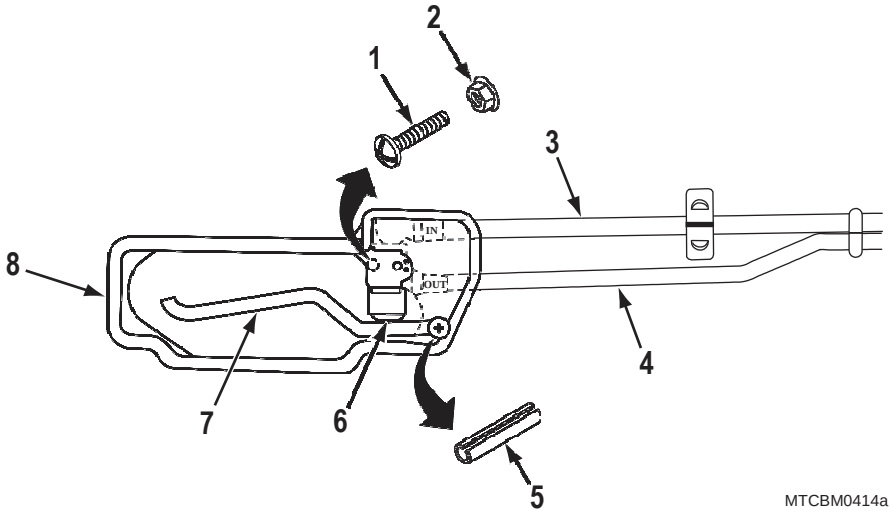


Figure 2. Deadman Control Handle Assembly Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
DEADMAN CONTROL TUBING MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0086
WP 0285

Materials/Parts
Tape, Antiseize (WP 0293, Table 1, Item 29)

Equipment Condition
Semitrailer uncoupled (WP 0007)

NOTE

- The following procedure applies to all deadman control tubes and fittings.
- Tag all hoses prior to removal for ease of installation.

REMOVAL

1. Disconnect air line tubing (Figure 1, Item 3) from fitting (Figure 1, Item 1).
2. Cut end of hose and remove nut (Figure 1, Item 2).
3. Release clips and pull air line tubing (Figure 1, Item 3) through grommets.
4. Remove fitting (Figure 1, Item 1).

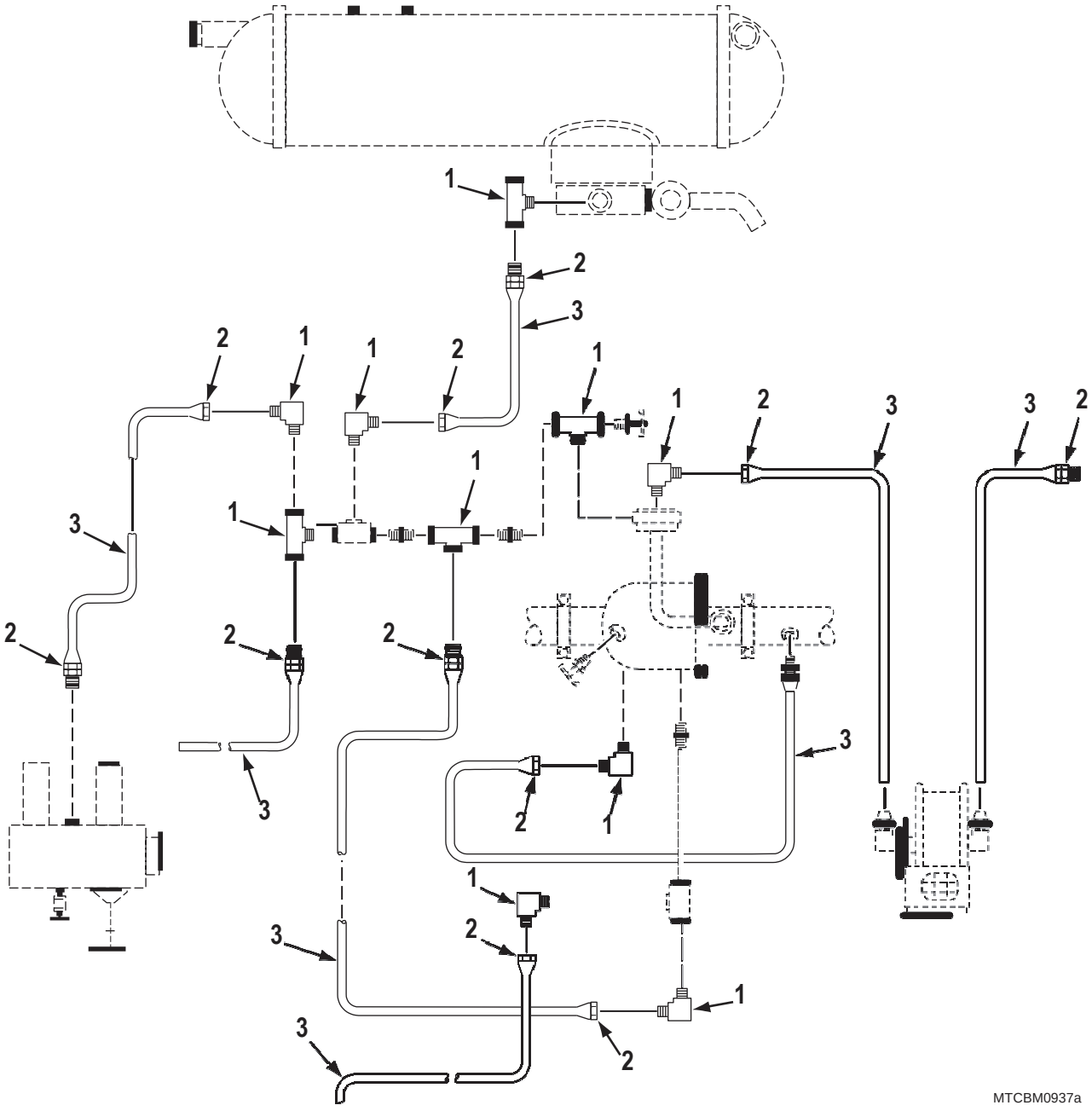


Figure 1. Deadman Control Tubing Maintenance.

END OF TASK

INSTALLATION

1. Apply antiseize tape to fitting (Figure 1, Item 1) and install fitting.
2. Pull air line tubing (Figure 1, Item 3) through grommets and secure with clips.
3. Assemble air line with nut (Figure 1, Item 2) (WP 0285).

END OF TASK

FOLLOW ON TASK

Perform leak test on air line (WP 0086).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
STATIC REEL AND ELECTRICAL CLIP REPAIR

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (4) (WP 0295, Table 1, Item 166)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

DISASSEMBLY

1. Remove four screws (Figure 1, Item 3), eight washers (Figure 1, Item 4), four self-locking nuts (Figure 1, Item 5), and static reel (Figure 1, Item 2) from cabinet (Figure 1, Item 6). Discard self-locking nuts (Figure 1, Item 5).
2. Remove two Allen head screws (Figure 1, Item 7) and electrical clip (Figure 1, Item 8) from cable (Figure 1, Item 1).

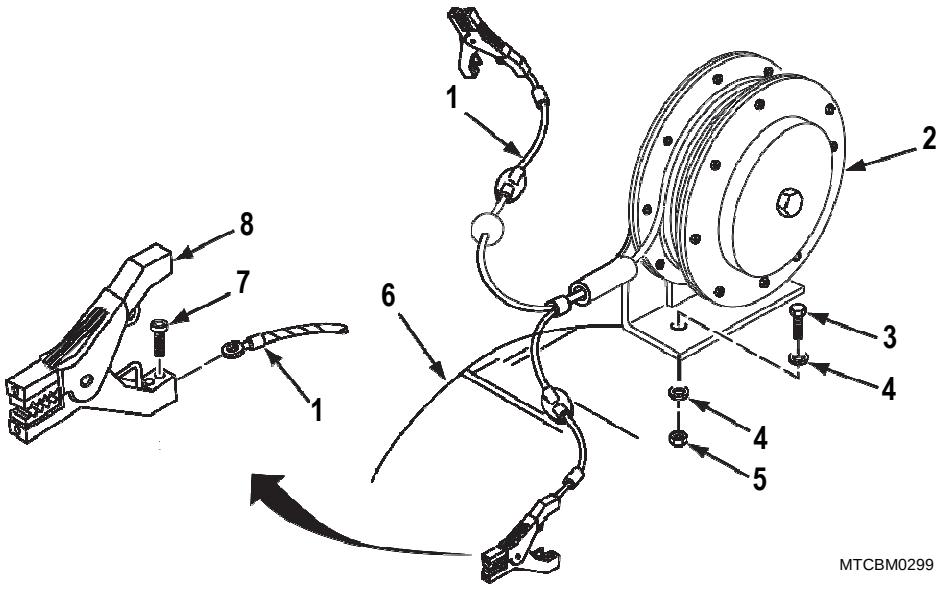


Figure 1. Static Reel and Electrical Clip Disassembly.

END OF TASK

ASSEMBLY

1. Install static reel (Figure 2, Item 2) on cabinet (Figure 2, Item 6) with four screws (Figure 2, Item 3), eight washers (Figure 2, Item 4), and four new self-locking nuts (Figure 2, Item 5).
2. Install electrical clip (Figure 2, Item 8) on cable (Figure 2, Item 1) with screw (Figure 2, Item 7).

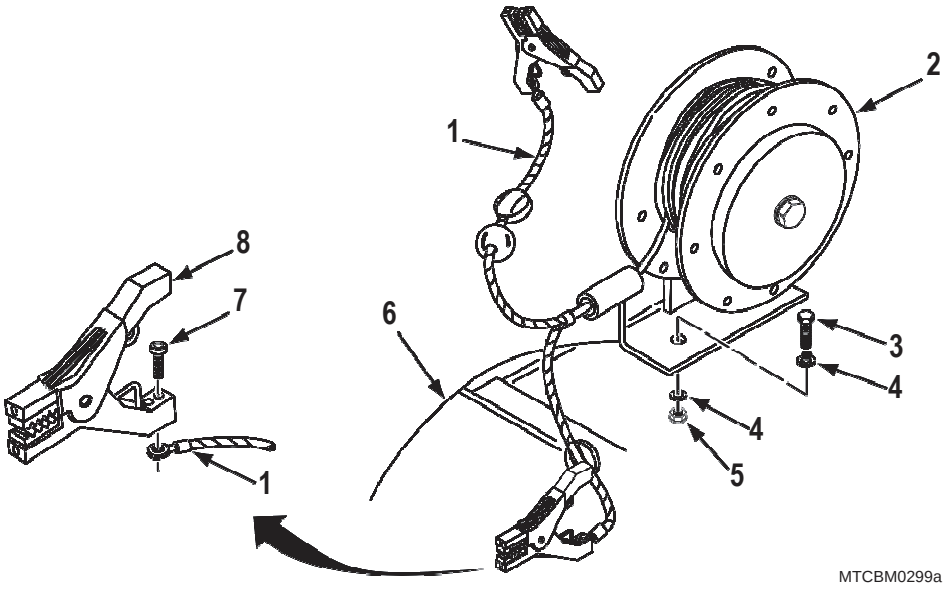


Figure 2. Static Reel and Electrical Clip Assembly.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HOSE REEL CABINET MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Gloves, Welder's (WP 0294, Table 1, Item 11)
Torch Set, Cutting and Welding
(WP 0294, Table 1, Item 21)

Materials/Parts
Nut, Self-Locking
Qty: (28) (WP 0295, Table 1, Item 174)

Personnel Required
Two

References
TC 9-237
WP 0004

Equipment Condition
Negative battery cable disconnected (WP 0098)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)
Volumetric meter assembly removed (WP 0244)

REMOVAL

NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

1. Disconnect accumulator line (Figure 1, Item 3) at fitting at rear of cabinet (Figure 1, Item 1).
2. Pull accumulator line (Figure 1, Item 3) into cabinet (Figure 1, Item 1).
3. Disconnect control cable (Figure 1, Item 2) from trip bar at top left side of cabinet (Figure 1, Item 1).

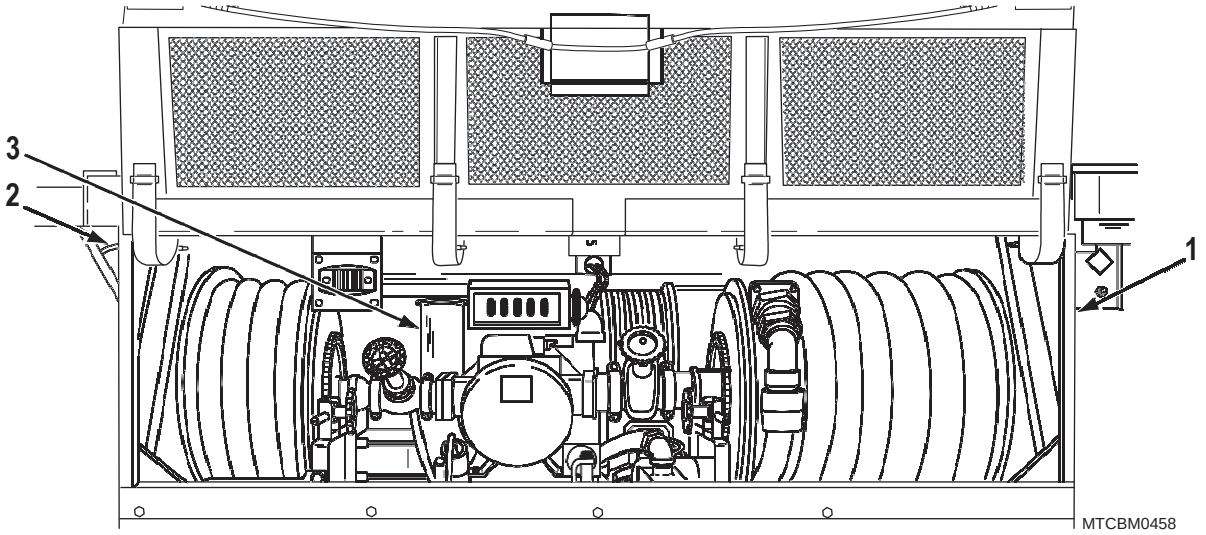


Figure 1. Hose Reel Cabinet Door Frame Disconnection.

REMOVAL - Continued

CAUTION

Two persons are required to remove door and frame. Failure to comply may result in damage to, or destruction of, equipment or mission.

4. Remove 10 capscrews (Figure 2, Item 4), flatwashers (Figure 2, Item 3), self-locking nuts (Figure 2, Item 2), cabinet door (Figure 2, Item 5), and frame (Figure 2, Item 1). Discard self-locking nuts (Figure 2, Item 2).

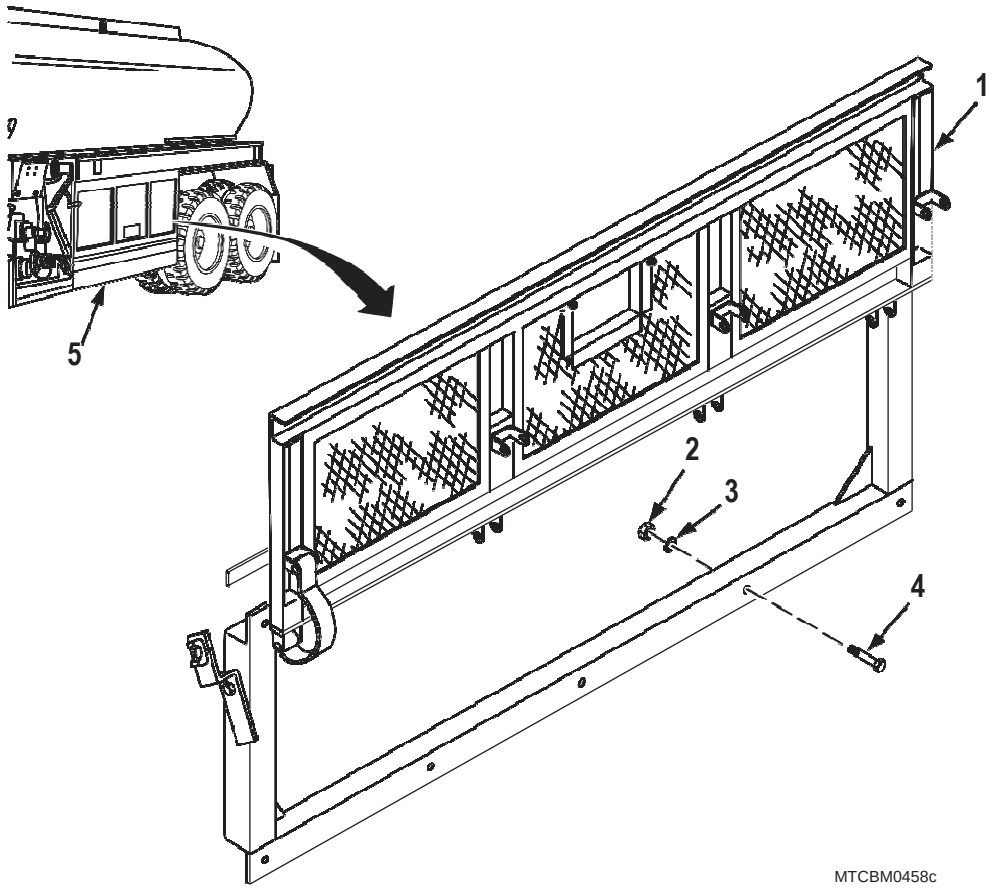


Figure 2. Hose Reel Cabinet Door Frame Removal.

NOTE

Label lines prior to removal for ease of installation.

5. Disconnect three lines (Figure 3, Item 2) on parking brake control valve (Figure 3, Item 5) and pull lines through hole in rear of cabinet (Figure 3, Item 4).
6. Disconnect line to deadman reel (Figure 3, Item 3) and pull line through hole in rear of cabinet (Figure 3, Item 4).
7. Disconnect line from flow control valve (Figure 3, Item 5) and pull line through hole in rear of cabinet (Figure 3, Item 4).
8. Disconnect meter inlet pipe (Figure 2, Item 6) by removing split coupling from outside rear of cabinet (Figure 3, Item 3).

REMOVAL - Continued

WARNING

Ensure that lifting device is properly positioned under cabinet. The entire weight of the cabinet is now on the lifting device. Failure to follow this warning may result in cabinet falling. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

9. Position lifting device under cabinet (Figure 3, Item 3) and slightly relieve pressure on mounting screws (Figure 3, Item 7) and nuts (Figure 3, Item 8).

NOTE

There are seven mounting screws on the top left side, eight on the top right side, and three on the bottom left side of the cabinet.

10. Remove 18 mounting screws (Figure 3, Item 7) and self-locking nuts (Figure 3, Item 8), and cabinet (Figure 3, Item 4) from trailer. Discard self-locking nuts (Figure 3, Item 8).

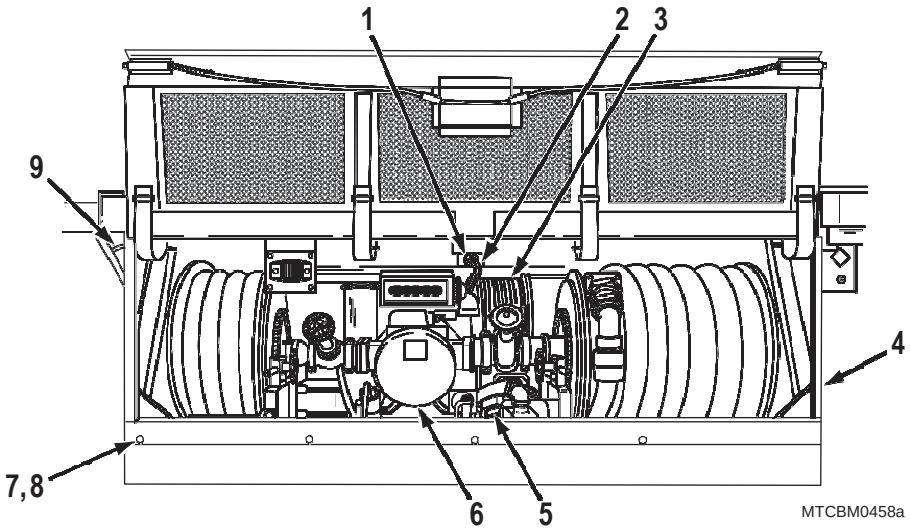


Figure 3. Hose Reel Cabinet Removal.

CAUTION

Before removing cabinet, make sure that all disconnections have been made. Failure to comply may result in damage to, or destruction of, equipment or mission.

11. Lower cabinet slightly and pull lead (Figure 3, Item 9) from junction box at rear of cabinet (Figure 3, Item 4).

12. Remove cabinet (Figure 3, Item 4).

END OF TASK

REPAIR

1. Straighten bent or dented metal.
2. Repair cracks by welding TM 9-237.

END OF TASK

INSTALLATION

WARNING

Ensure that lifting device is properly positioned under cabinet. The entire weight of the cabinet is now on the lifting device. Failure to follow this warning may result in cabinet falling. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Position lifting device under cabinet (Figure 4, Item 4).
2. Position cabinet (Figure 4, Item 4) under semitrailer and secure with 18 mounting screws (Figure 4, Item 7) and new self-locking nuts (Figure 4, Item 8). Remove lifting device.
3. Connect meter inlet pipe (Figure 4, Item 6) by installing split coupling on outside rear of cabinet (Figure 4, Item 4).
4. Thread lead (Figure 4, Item 9) to inside of junction box on rear of cabinet (Figure 4, Item 4).

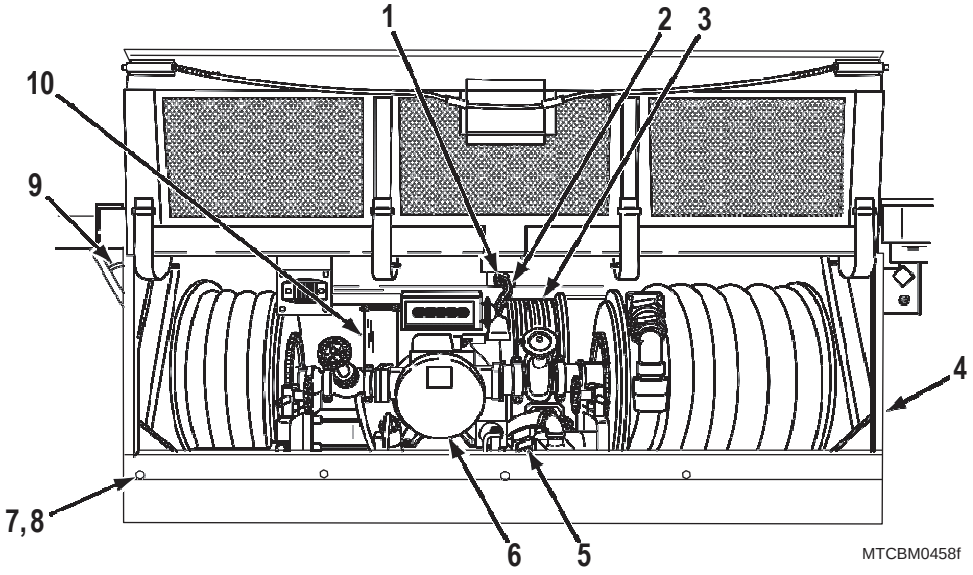


Figure 4. Hose Reel Cabinet Installation.

INSTALLATION - Continued

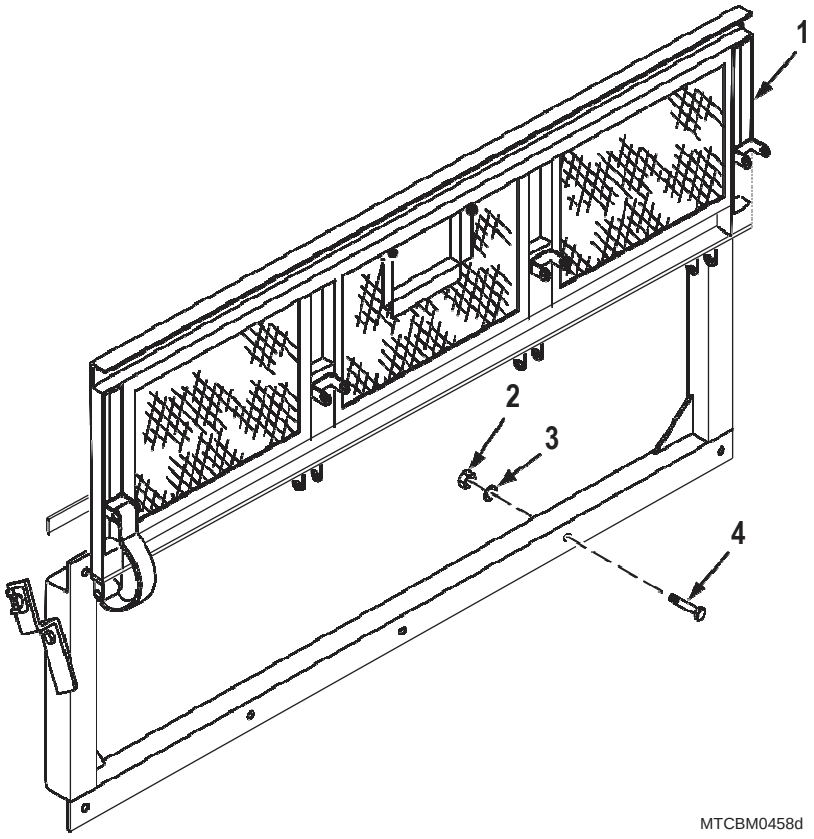


Figure 5. Hose Reel Cabinet Door Frame Installation.

5. Thread line through hole at rear of cabinet (Figure 4, Item 4) and connect line to flow control valve (Figure 4, Item 5).
6. Thread line through hole at rear of cabinet (Figure 4, Item 4) and connect line to deadman hose reel (Figure 4, Item 3).
7. Thread three lines (Figure 4, Item 2) through hole at rear of cabinet (Figure 4, Item 4) and connect lines (Figure 4, Item 2) to parking brake control valve (Figure 4, Item 1).
8. Connect control cable (Figure 4, Item 9) to trip bar at top left side of cabinet (Figure 4, Item 4).
9. Connect accumulator line (Figure 4, Item 10) at fitting at rear of cabinet (Figure 4, Item 4).
10. Position door and frame (Figure 5, Item 1) and secure with 10 capscrews (Figure 5, Item 4), flatwashers (Figure 5, Item 3), and new self-locking nuts (Figure 5, Item 2).

END OF TASK

FOLLOW ON TASK

1. Install volumetric meter assembly (WP 0244).
2. Remove ground (WP 0008).
3. Connect negative battery cables (WP 0098).
4. Operate dispensing equipment and check for leaks (WP 0004).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HOSE REEL CABINET REPLACEMENT (M969A1 AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (16) (WP 0295, Table 1, Item 160)
Nut, Self-Locking
Qty: (11) (WP 0295, Table 1, Item 162)

Personnel Required
Two

Equipment Condition
Negative battery cable disconnected (WP 0098)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)
Volumetric meter assembly removed (WP 0244)

REMOVAL

1. Disconnect lead 14 (Figure 1, Item 3) from electrical junction box (Figure 1, Item 2) on rear of hose reel cabinet (Figure 1, Item 1).
2. Disconnect conduit (Figure 1, Item 4) from electrical junction box (Figure 1, Item 2).

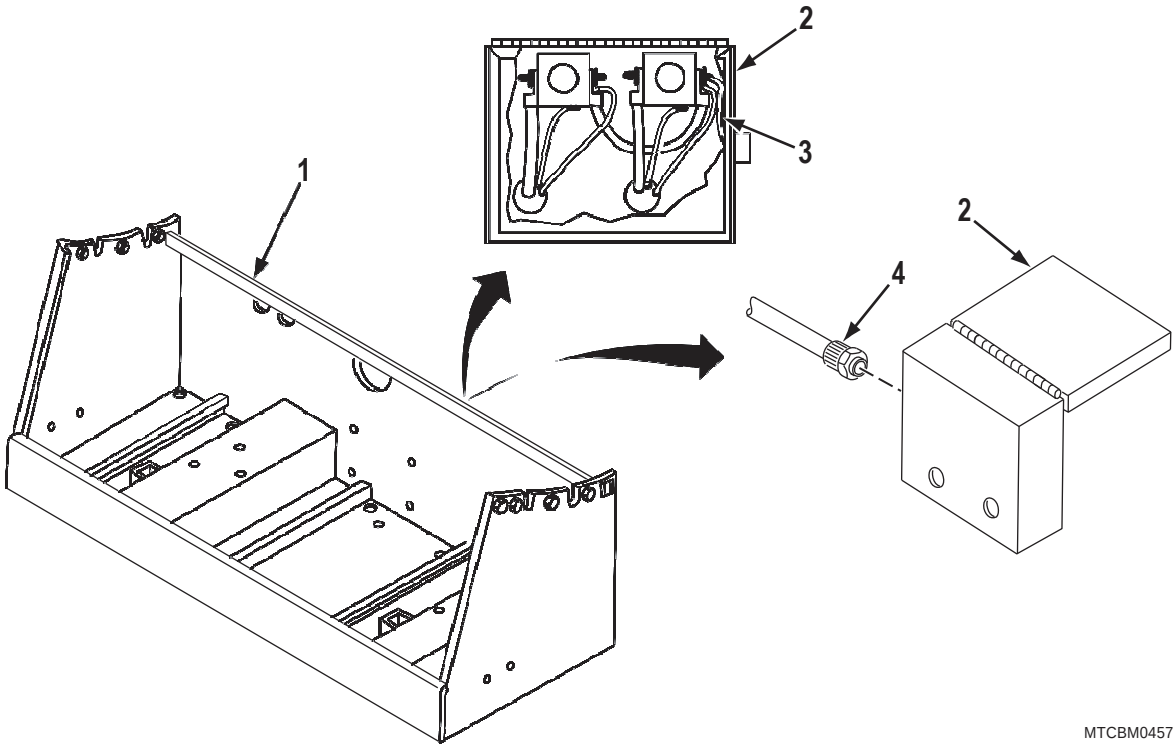


Figure 1. Electrical Junction Box Removal.

REMOVAL - Continued

WARNING

Door and frame assembly is 200 lbs (91 kg). To prevent injury to personnel, two persons are required when removing door and frame assembly from vehicle. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Two persons are required to remove door and frame. Failure to comply may result in damage to, or destruction of, equipment or mission.

3. Remove screws (Figure 2, Item 1), washers (Figure 2, Item 3), and self-locking nuts (Figure 2, Item 4) from door and frame assembly (Figure 2, Item 5). Remove door and frame assembly (Figure 2, Item 5) and two plates (Figure 2, Items 2 and 6) from hose reel cabinet (Figure 2, Item 7). Discard self-locking nuts (Figure 2, Item 3).

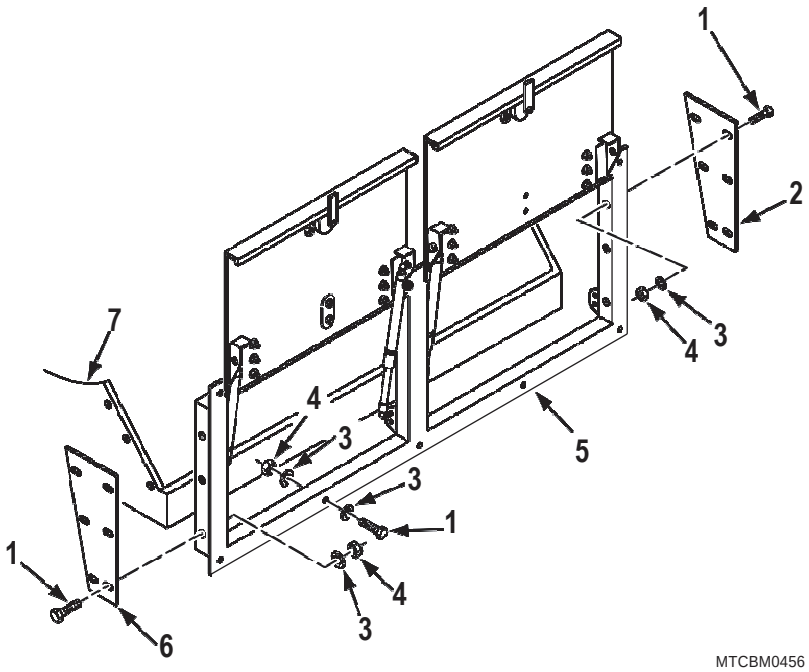


Figure 2. Hose Reel Cabinet Removal.

NOTE

To relieve pressure on mounting screws and nuts, position forklift and lift cabinet slightly.

4. Remove eleven screws (Figure 3, Item 1) and self-locking nuts (Figure 3, Item 2) from hose reel cabinet (Figure 3, Item 3), and remove cabinet (Figure 3, Item 3) from semitrailer. Discard self-locking nuts (Figure 3, Item 2).

REMOVAL - Continued

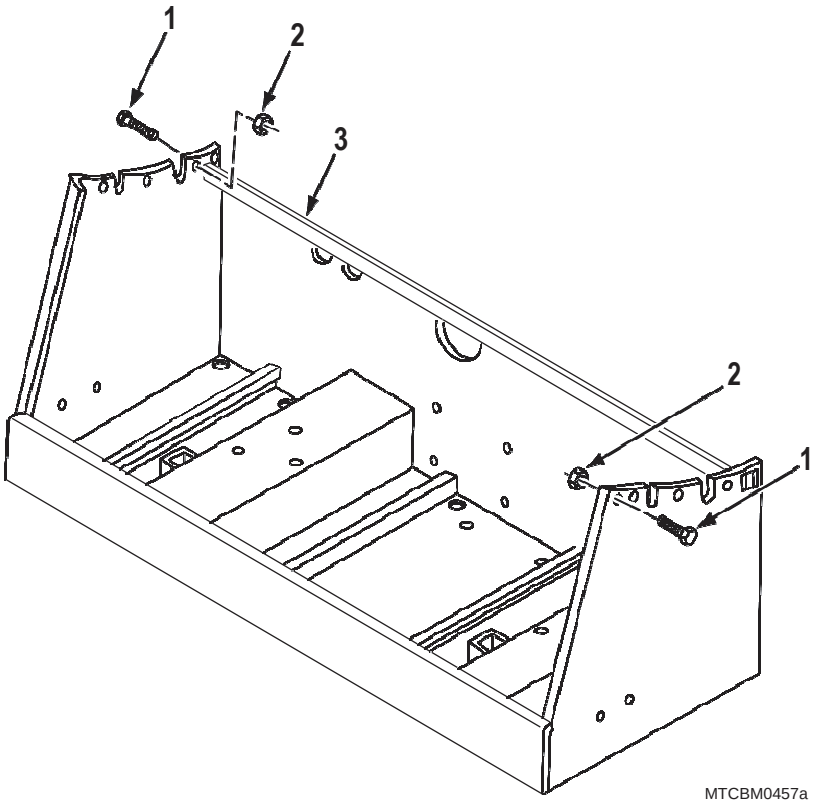


Figure 3. Hose Reel Cabinet Frame.

END OF TASK

INSTALLATION

NOTE

Use lifting device to position hose reel cabinet under semitrailer.

1. Install hose reel cabinet (Figure 3, Item 3) on semitrailer, and install screws (Figure 3, Item 1) and new self-locking nuts (Figure 3, Item 2) in hose reel cabinet (Figure 3, Item 3).

INSTALLATION - Continued

WARNING

Door and frame assembly is 200 lbs (91 kg). To prevent injury to personnel, two persons are required when removing door and frame assembly from vehicle. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Two persons are required to remove door and frame. Failure to comply may result in damage to, or destruction of, equipment or mission.

2. Install door and frame assembly (Figure 4, Item 5) and two plates (Figure 4, Items 2 and 6) on hose reel cabinet (Figure 4, Item 7) with screws (Figure 4, Item 1), washers (Figure 4, Item 3). and new self-locking nuts (Figure 4, Item 4).

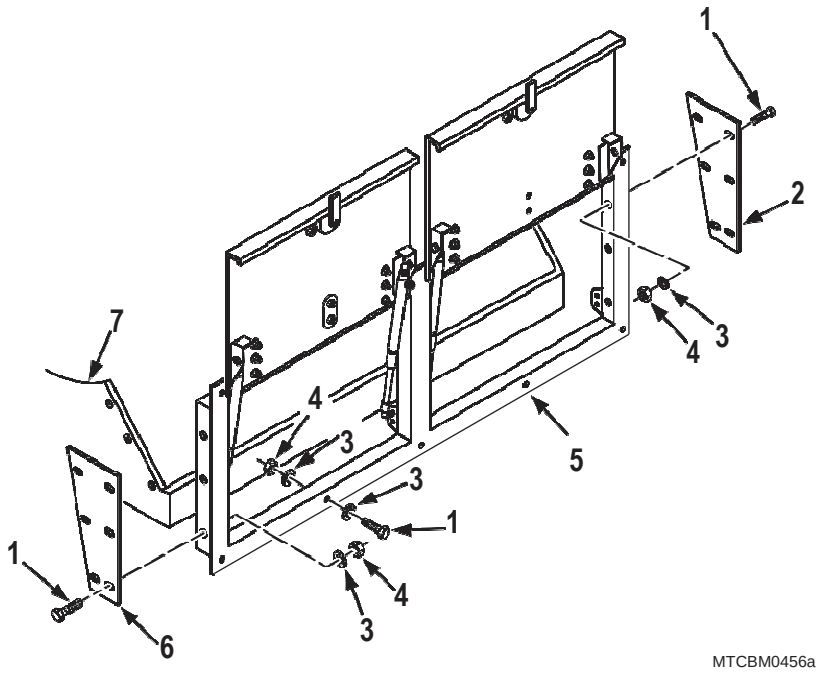


Figure 4. Hose Reel Cabinet Installation.

3. Connect conduit (Figure 5, Item 4) to electrical junction box (Figure 5, Item 2) on rear of hose reel cabinet (Figure 5, Item 1).
4. Connect lead 14 (Figure 5, Item 3) to electrical junction box (Figure 5, Item 2) on rear of hose reel cabinet (Figure 5, Item 1).

INSTALLATION - Continued

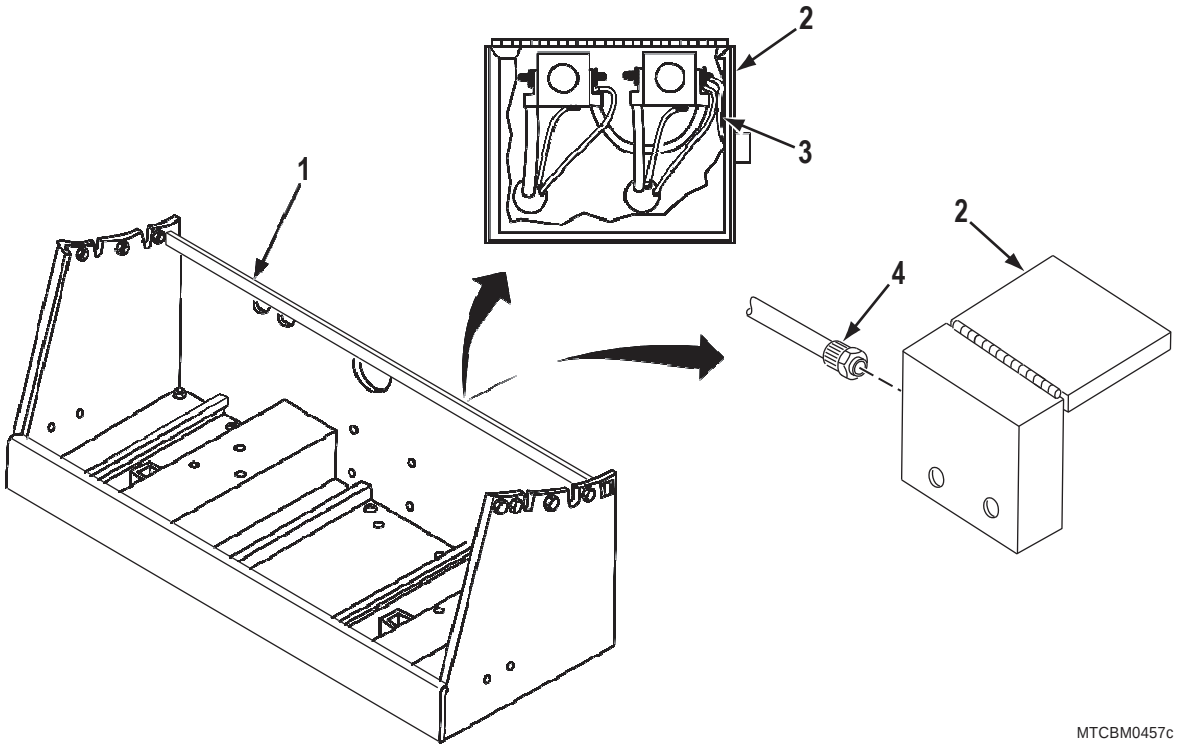


Figure 5. Electrical Junction Box Installation.

END OF TASK

FOLLOW ON TASK

1. Replace meter assemblies (WP 0244).
2. Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CABINET DOOR MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Remove cabinet door (WP 0159)

Materials/Parts
Pin, Cotter (WP 0295, Table 1, Item 150)

REPLACEMENT OF LATCHING CABLE

1. Loosen cable clamps at ends of cable (Figure 1, Item 2) and pull cable from latches and guides (Figure 1, Item 1).
2. Install cable (Figure 1, Item 2) through the guides and latches, and secure with cable clamps. Adjust length of cable to ensure full release and engagement of both latches.

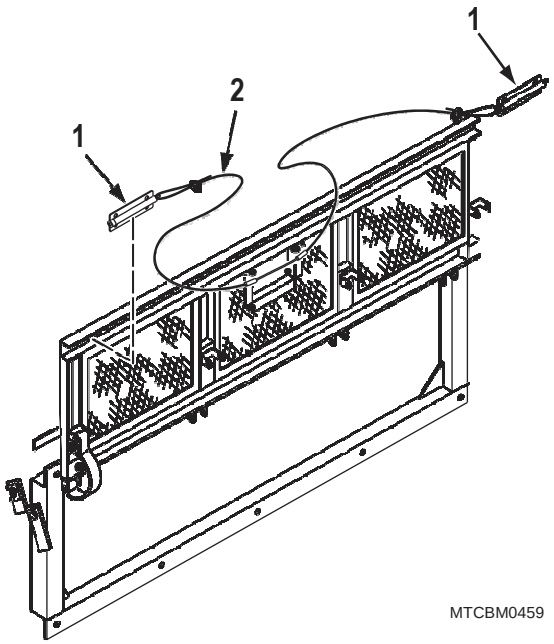


Figure 1. Trip Bar Replacement.

END OF TASK

REPLACEMENT OF TRIP BAR

1. Remove nut (Figure 2, Item 7), washer (Figure 2, Item 8), screw (Figure 2, Item 10), washer (Figure 2, Item 11), trip bar (Figure 2, Item 9), and washer (Figure 2, Item 12).
2. Assemble screw (Figure 2, Item 10), washer (Figure 2, Item 11), trip bar (Figure 2, Item 9), and washer (Figure 2, Item 12).
3. Push screw (Figure 2, Item 10) through hole in frame (Figure 2, Item 2) and secure with washer (Figure 2, Item 8) and nut (Figure 2, Item 7).

END OF TASK

REPLACEMENT OF DOOR SPRING

1. Remove cotter pin (Figure 2, Item 3) and washer (Figure 2, Item 4) from one end of pin (Figure 2, Item 5). Remove pin (Figure 2, Item 5) from spring (Figure 2, Item 6). Repeat at other end of spring (Figure 2, Item 6).
2. Align spring (Figure 2, Item 6) in either door (Figure 2, Item 1) or frame bracket and push pin (Figure 2, Item 5) through spring (Figure 2, Item 6) and bracket (Figure 2, Item 1).
3. Secure with washers (Figure 2, Item 4) and cotter pins (Figure 2, Item 3). Repeat at other end of spring (Figure 2, Item 6).

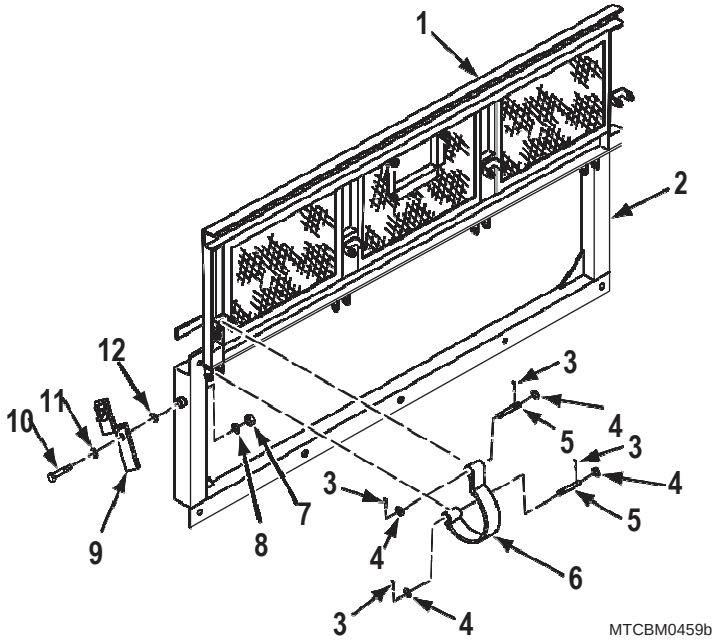


Figure 2. Door Spring Replacement.

END OF TASK

FOLLOW ON TASK

Install cabinet door (WP 0159).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HOSE REEL CABINET DOOR LOCK-RELEASE LEVER REPLACEMENT (M969A1 AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (4) (WP 0295, Table 1, Item 177)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

NOTE

- Doors do not have to be removed from hose reel cabinets to perform this task.
- Use these Steps to remove either hose reel cabinet door lock-release lever.

1. Open cabinet door (Figure 1, Item 1).
2. Remove four screws (Figure 1, Item 4), washers (Figure 1, Item 2), and self-locking nuts (Figure 1, Item 3) from lock-release lever (Figure 1, Item 5) and cabinet door (Figure 1, Item 1). Discard self-locking nuts (Figure 1, Item 3).

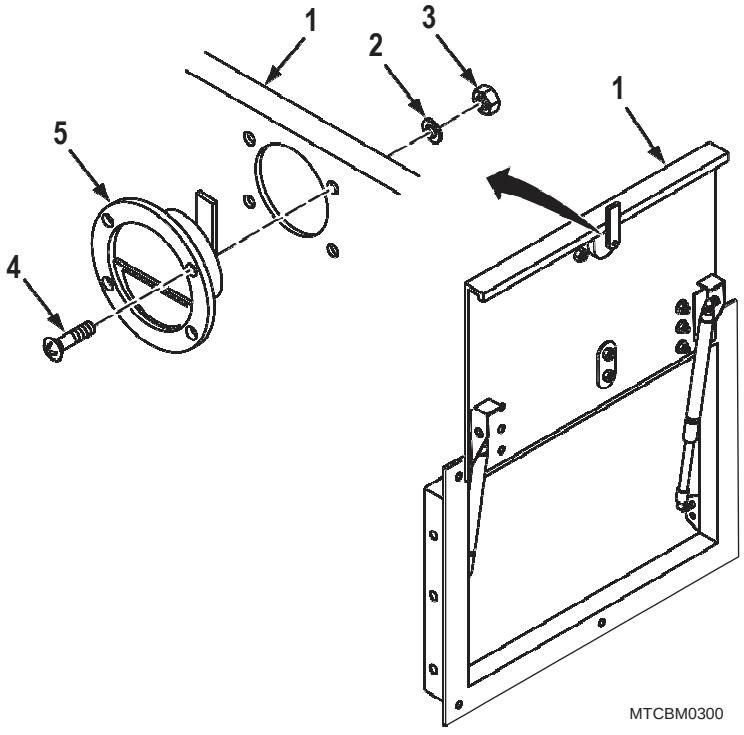


Figure 1. Hose Reel Cabinet Door Lock-Release Lever Removal.

REMOVAL - Continued

3. Remove lock-release lever (Figure 2, Item 5) from cabinet door (Figure 2, Item 1).

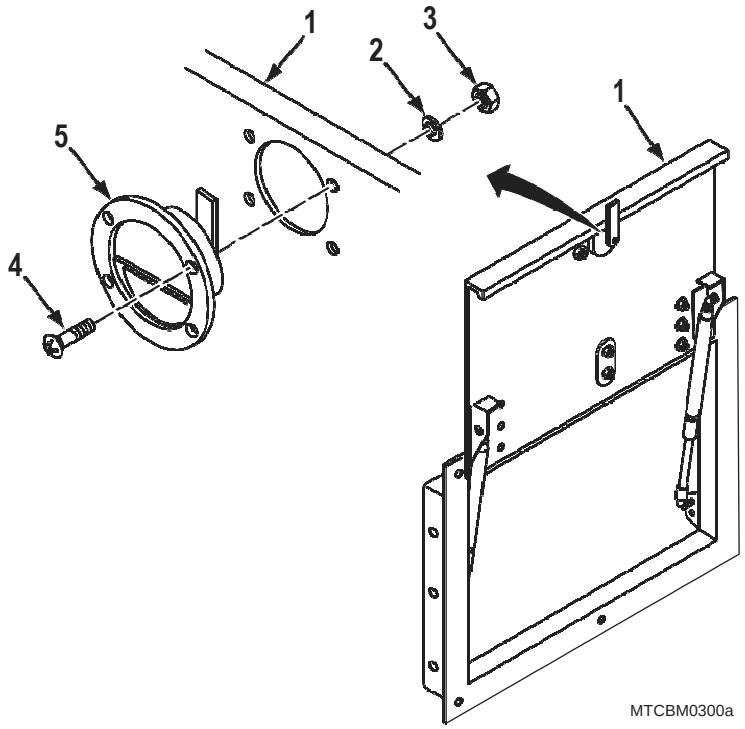


Figure 2. Hose Reel Cabinet Door Lock-Release Lever Installation.

END OF TASK

INSTALLATION

1. Position lock-release lever (Figure 2, Item 5) in place on cabinet door (Figure 2, Item 1) and install four screws (Figure 2, Item 4), washers (Figure 2, Item 2), and new self-locking nuts (Figure 2, Item 3).
2. Close cabinet door (Figure 2, Item 1).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HOSE REEL CABINET DOOR AND CABINET DOOR CYLINDER ASSEMBLY REPLACEMENT (M969A1 AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Pin, Cotter Qty: (2)
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (8) (WP 0295, Table 1, Item 162)

Equipment Condition
Semitrailer uncoupled (WP 0007)

NOTE

There are four cylinder assemblies. All assemblies are removed the same way. This work package shows the replacement of one cylinder assembly.

CABINET DOOR CYLINDER REMOVAL

1. Open hose reel cabinet door (Figure 1, Item 1).

NOTE

Cylinder assemblies come attached with either cotter pins and straight pins, or self-locking nuts and washers. Steps 2 and 3 are for the straight pins, and Step 4 is for the self-locking nuts.

2. Remove two cotter pins (Figure 1, Item 3) from two straight pins (Figure 1, Item 4). Discard cotter pins (Figure 1, Item 3).
3. Remove straight pins (Figure 1, Item 4) and cylinder assembly (Figure 1, Item 2) from hose reel cabinet (Figure 1, Item 5) and cabinet door (Figure 1, Item 1).

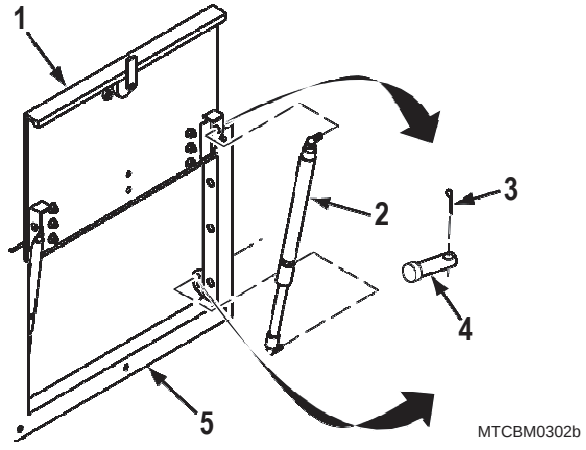


Figure 1. Hose Reel Cabinet Door Cylinder Assembly Removal.

CABINET DOOR CYLINDER REMOVAL - Continued

4. Remove two self-locking nuts (Figure 2, Item 3), washers (Figure 2, Item 2), and cylinder assembly (Figure 2, Item 4) from hose reel cabinet (Figure 2, Item 5) and cabinet door (Figure 2, Item 1). Discard self-locking nuts (Figure 2, Item 3).

END OF TASK

CABINET DOOR CYLINDER INSTALLATION

1. Position cylinder assembly (Figure 2, Item 4) in place in hose reel cabinet (Figure 2, Item 5) and on cabinet door (Figure 2, Item 1).

NOTE

Cylinder assemblies come attached with either cotter pins and straight pins, or self-locking nuts and washers. Step 2 is for the straight pins, and Step 3 is for the self-locking nuts.

2. Secure cylinder assembly (Figure 2, Item 4) with two straight pins (Figure 2, Item 6) and new cotter pins (Figure 2, Item 7).
3. Secure cylinder assembly (Figure 2, Item 4) with two new self-locking nuts (Figure 2, Item 3) and washers (Figure 2, Item 2).
4. Close hose reel cabinet door (Figure 2, Item 1).

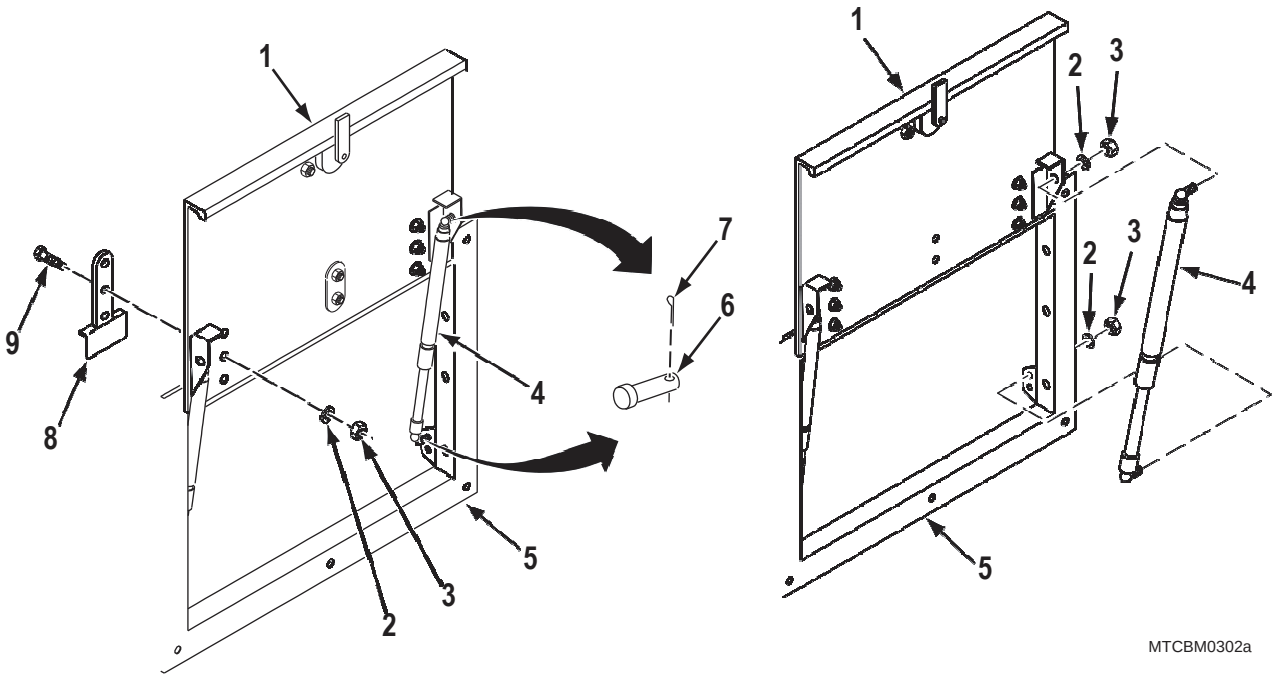


Figure 2. Hose Reel Cabinet Door Cylinder Assembly Replacement.

END OF TASK

CABINET DOOR REMOVAL

Remove six self-locking nuts (Figure 2, Item 3), washers (Figure 2, Item 2), bolts (Figure 2, Item 9), and cabinet door (Figure 2, Item 8) from cabinet door assembly (Figure 2, Item 5). Discard self-locking nuts (Figure 2, Item 3).

END OF TASK

CABINET DOOR INSTALLATION

Install cabinet door (Figure 2, Item 1), six bolts (Figure 2, Item 9), washers (Figure 2, Item 2), and new self-locking nuts (Figure 2, Item 3) on cabinet door assembly (Figure 2, Item 8).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
STORAGE BOX ASSEMBLY MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

WARNING

To avoid damage to equipment and injury to personnel, place support under storage box before removing mounting screws. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Remove two screws (Figure 1, Item 3) and nuts (Figure 1, Item 1) from storage box (Figure 1, Item 2).

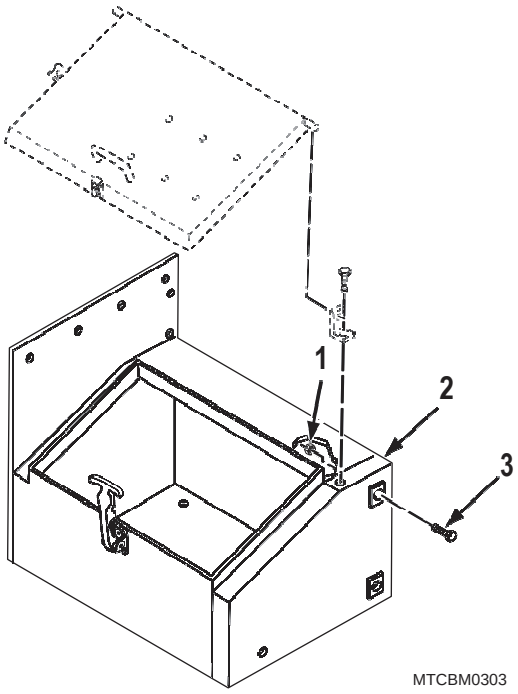


Figure 1. Storage Box Removal.

REMOVAL - Continued

WARNING

Wear eye protection to prevent eye injury when working with components that could fly through the air. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

On some semitrailers, storage box may be tack welded in position. Break weld with a cold chisel to remove storage box. Do not reweld when installing storage box.

2. Remove four mounting screws (Figure 2, Item 13) and nuts (Figure 2, Item 14), and remove storage box (Figure 2, Item 6).

END OF TASK

DISASSEMBLY

1. Remove two screws (Figure 2, Item 2), nuts (Figure 2, Item 4), angle brackets (Figure 2, Item 3), and cover (Figure 2, Item 1) from storage box (Figure 2, Item 6).

NOTE

Both metal and rubber catches are used on these storage boxes. Step 2 is for the metal catch, and Step 3 is for the rubber catch.

2. Remove screw (Figure 2, Item 17), nut (Figure 2, Item 15), and catch (Figure 2, Item 16) from cover (Figure 2, Item 1).
3. Remove screw (Figure 2, Item 9) and rubber catch (Figure 2, Item 10) from bracket (Figure 2, Item 12).
4. Remove two screws (Figure 2, Item 11), nuts (Figure 2, Item 8), and bracket (Figure 2, Item 12) from storage box (Figure 2, Item 6).

END OF TASK

INSPECTION

Inspect parts for cracks, bends, or damage. Replace defective parts.

END OF TASK

ASSEMBLY

1. Install bracket (Figure 2, Item 12) on storage box (Figure 2, Item 6) with two screws (Figure 2, Item 11) and nuts (Figure 2, Item 8).

NOTE

Both metal and rubber catches are used on these storage boxes. Step 3 is for the metal catch, and Step 2 is for the rubber catch.

ASSEMBLY - Continued

2. Install rubber catch (Figure 2, Item 10) on bracket (Figure 2, Item 12) with screw (Figure 2, Item 9).
3. Install catch (Figure 2, Item 16) on cover (Figure 2, Item 1) with screw (Figure 2, Item 17) and nut (Figure 2, Item 15).
4. Install cover (Figure 2, Item 1) on storage box (Figure 2, Item 6) with two screws (Figure 2, Item 2), nuts (Figure 2, Item 4), and angle brackets (Figure 2, Item 3).

END OF TASK

INSTALLATION

1. Install storage box (Figure 2, Item 6) on semitrailer with four mounting screws (Figure 2, Item 13) and nuts (Figure 2, Item 14).
2. Install two screws (Figure 2, Item 7) and nuts (Figure 2, Item 5) on storage box (Figure 2, Item 6).

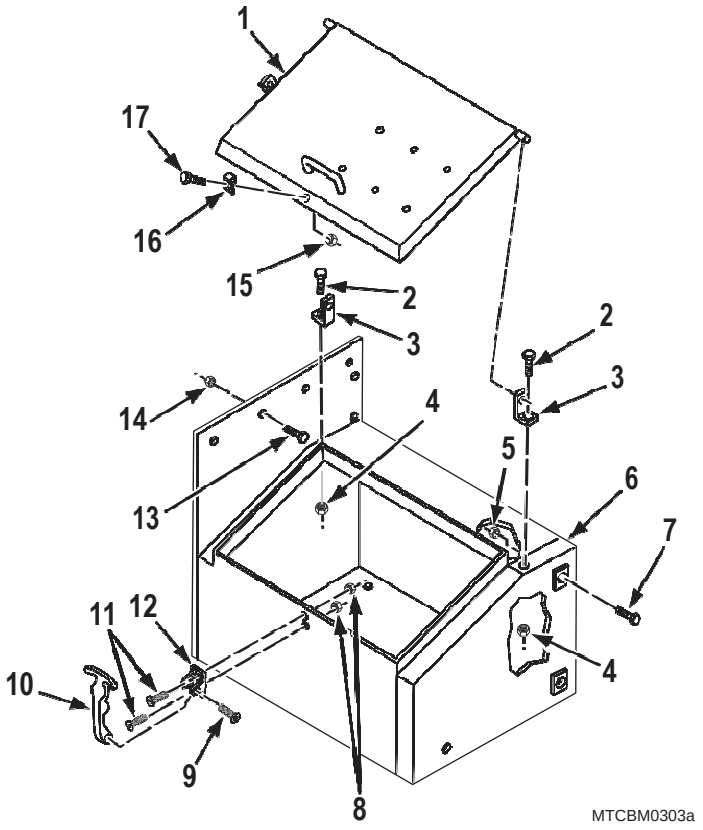


Figure 2. Storage Box Maintenance.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE AND PUMP CABINET FRAME REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket Qty: (2) (WP 0295, Table 1, Item 11)
Gasket (WP 0295, Table 1, Item 12)
Gasket (WP 0295, Table 1, Item 16)
Gasket (WP 0295, Table 1, Item 23)
Nut, Self-Locking
Qty: (24) (WP 0295, Table 1, Item 160)
Nut, Self-Locking
Qty: (14) (WP 0295, Table 1, Item 162)
Seal Qty: (2) (WP 0295, Table 1, Item 11)
Strap, Tiedown
Qty: (2) (WP 0293, Table 1, Item 27)

Personnel Required
Two

Equipment Condition
Batteries removed (WP 0097)
Curbside hose through access cover removed
(WP 0145)
Engine throttle cable disconnected (WP 0212)
Fuel tank drained and purged (WP 0010)
Muffler and exhaust pipe removed (WP 0213)
Piping control assembly removed (Lombardini)
(WP 0254)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

NOTE

Perform Steps 1 through 4 for Onan engine and Steps 5 through 8 for Lombardini engine.

1. Tag and remove 1/4 in. (6.35 mm) oil pressure tube (Figure 1, Item 4) from oil adapter (Figure 1, Item 2). Tag and remove 1/4 in. (6.35 mm) fuel pressure tube (Figure 1, Item 5) from tee (Figure 1, Item 1) on primary fuel filter (Figure 1, Item 3).

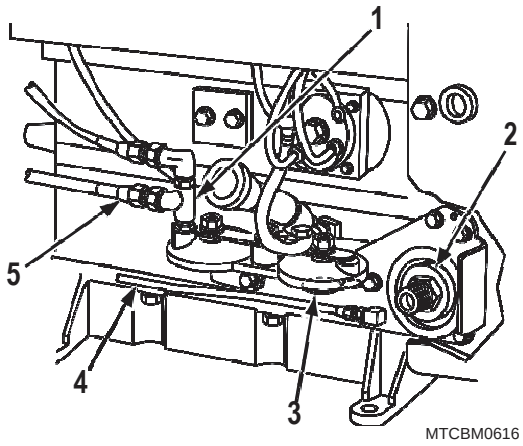


Figure 1. Oil Pressure Tube Removal.

2. Disconnect two electrical leads (Figure 2, Items 1 and 3) from engine electrical box (Figure 2, Item 2).
3. Disconnect electrical lead (Figure 2, Item 4) from alternator (Figure 2, Item 5).

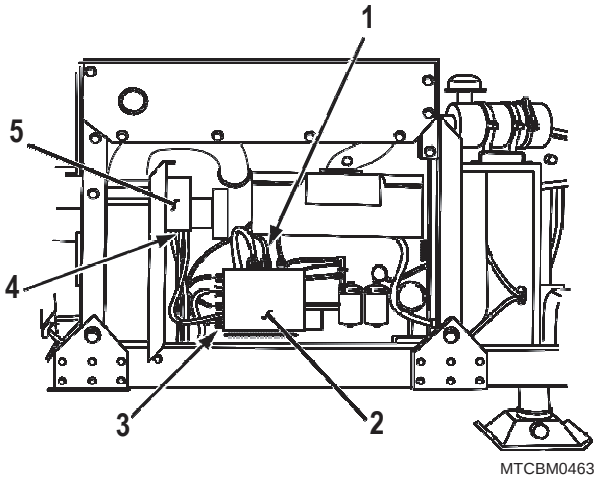


Figure 2. Electrical Leads Removal.

REMOVAL - Continued

4. Disconnect air restriction tube (Figure 3, Item 2) from air intake manifold (Figure 3, Item 1).

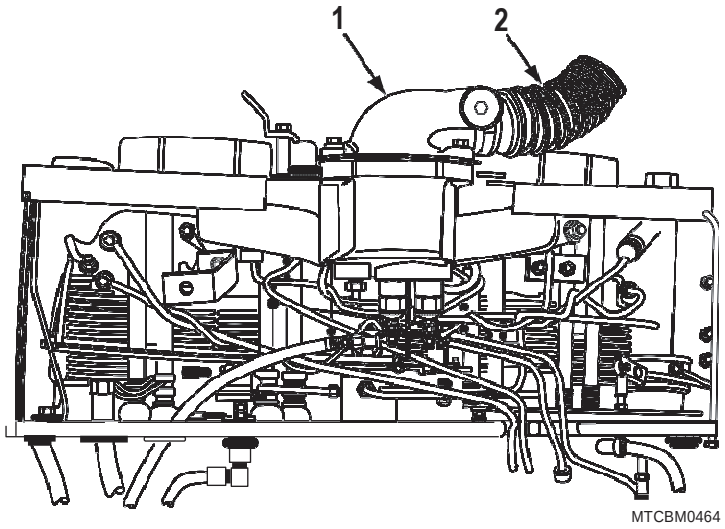


Figure 3. Air Restriction Tube Removal.

5. Remove nut (Figure 4, Item 2) and lead (Figure 4, Item 1) from starter motor (Figure 4, Item 3).

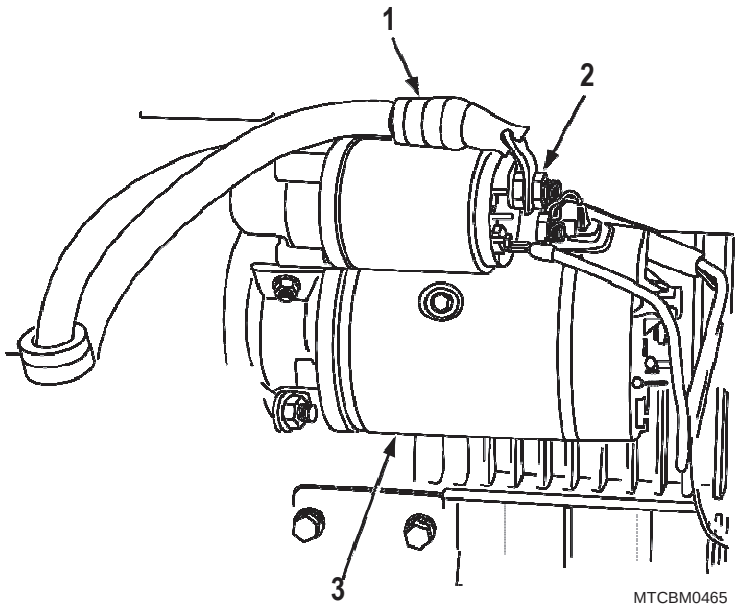


Figure 4. Lead Removal.

REMOVAL - Continued

6. Disconnect air restriction tube (Figure 5, Item 2) from air intake manifold (Figure 5, Item 1).

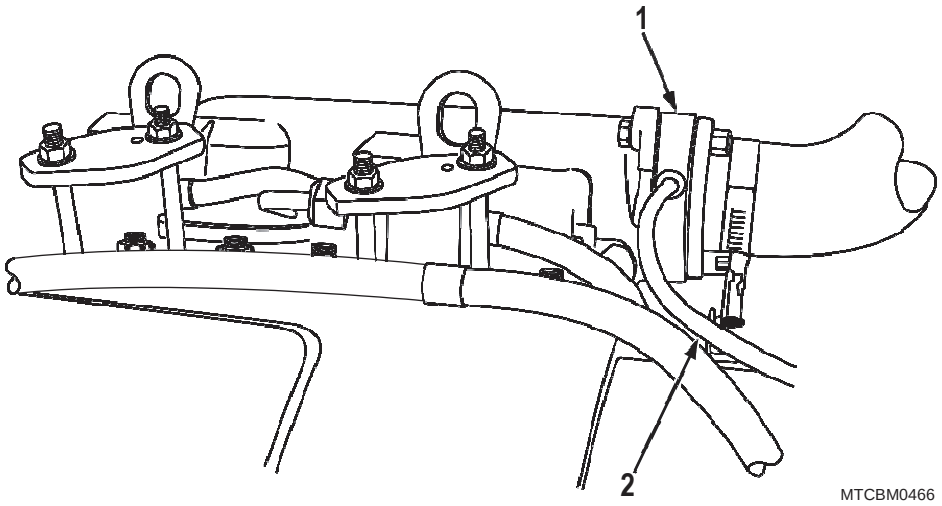


Figure 5. Air Intake Manifold.

7. Remove nut and throttle cable (Figure 6, Item 1) from governor lever (Figure 6, Item 2).

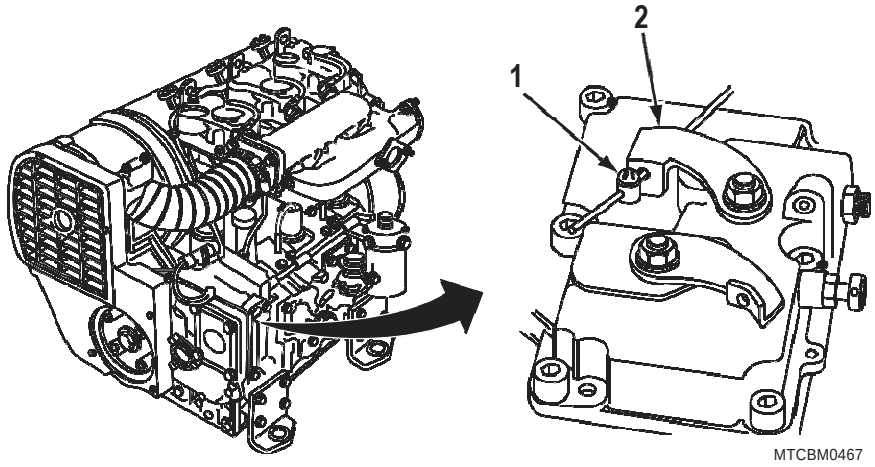


Figure 6. Throttle Cable Removal.

REMOVAL - Continued

8. Disconnect fuel supply line and return lines from fittings on fuel tank.
9. Remove four self-locking nuts (Figure 7, Item 4), washers (Figure 7, Item 5), and screws (Figure 7, Item 3) from engine fan shroud (Figure 7, Item 2) on frame (Figure 7, Item 6) and support (Figure 7, Item 1). Discard self-locking nuts (Figure 7, Item 4).

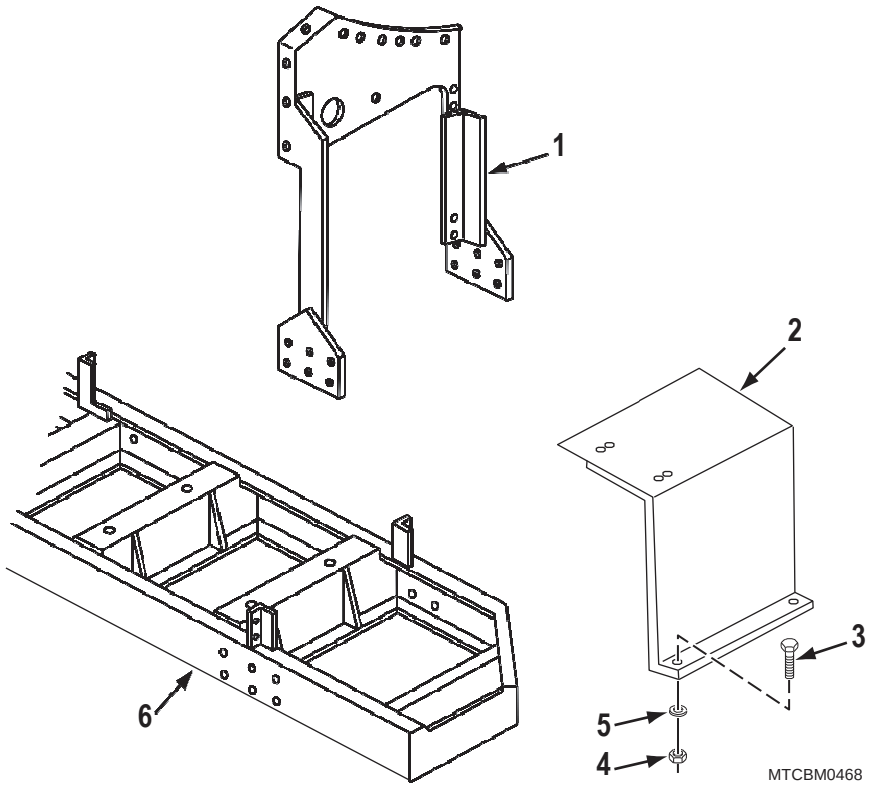


Figure 7. Cabinet Frame Removal.

REMOVAL - Continued

10. Remove two locknuts (Figure 8, Item 17), screws (Figure 8, Item 20), and conduit mounting plate (Figure 8, Item 19) from cabinet frame (Figure 8, Item 18). Discard locknuts (Figure 8, Item 17).
11. Remove drain plug (Figure 8, Item 5) from pump (Figure 8, Item 4) and allow fluid to drain. Reinstall drain plug (Figure 8, Item 5) in pump (Figure 8, Item 4).
12. Remove two screws (Figure 8, Item 10), coupling (Figure 8, Item 9), and gasket (Figure 8, Item 11) from inlet tube (Figure 8, Item 8) and tube (Figure 8, Item 12). Discard gasket (Figure 8, Item 11).
13. Remove eight self-locking nuts (Figure 8, Item 7), inlet tube (Figure 8, Item 8), and gasket (Figure 8, Item 6) from pump (Figure 8, Item 4). Remove plug (Figure 8, Item 13), coupling (Figure 8, Item 14), and gasket (Figure 8, Item 15) only if necessary. Discard gaskets (Figure 8, Item 15).
14. Remove two screws (Figure 8, Item 23), coupling (Figure 8, Item 22), and gasket (Figure 8, Item 21) from outlet tube (Figure 8, Item 16) and elbow (Figure 8, Item 1). Discard gasket (Figure 8, Item 21).
15. Remove eight self-locking nuts (Figure 8, Item 2), elbow (Figure 8, Item 1), and gasket (Figure 8, Item 3) from pump (Figure 8, Item 4). Discard self-locking nuts (Figure 8, Item 2) and gasket (Figure 8, Item 3).

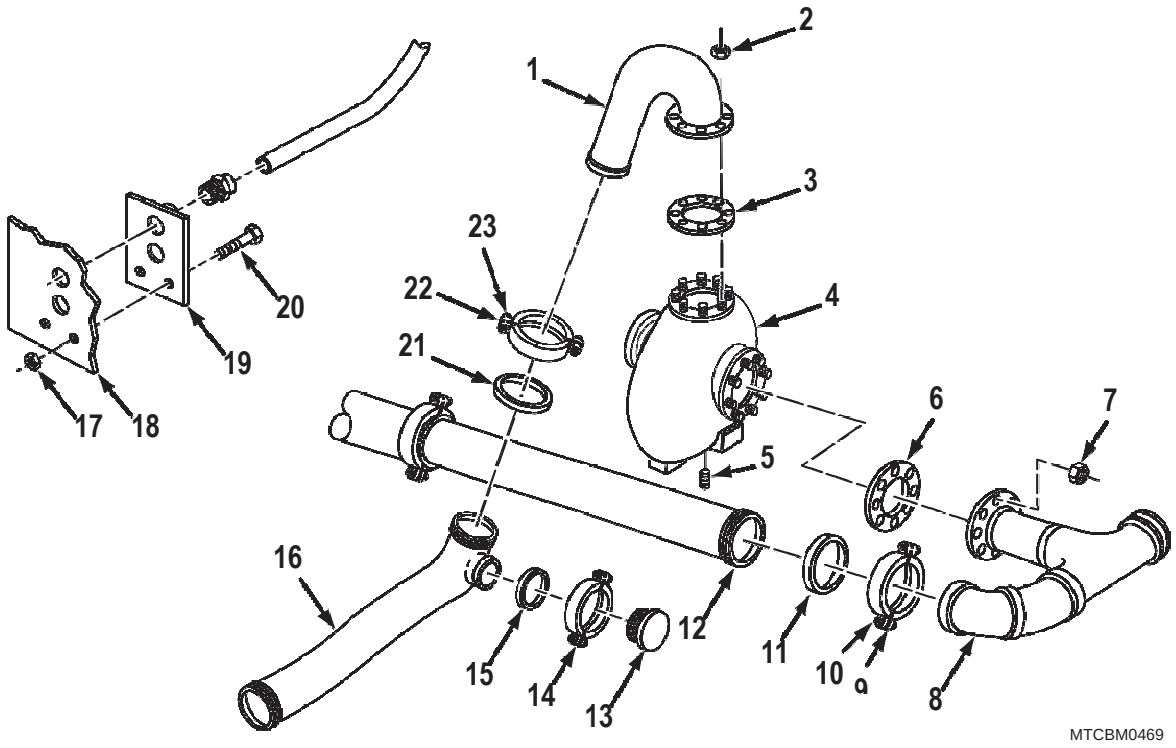


Figure 8. Engine Pump Piping Removal.

REMOVAL - Continued

16. Remove six self-locking nuts (Figure 9, Item 6), screws (Figure 9, Item 3), and support bracket (Figure 9, Item 4) from cabinet frame (Figure 9, Item 5). Discard self-locking nuts (Figure 9, Item 6).
17. Remove four self-locking nuts (Figure 9, Item 9), screws (Figure 9, Item 7), and cabinet frame (Figure 9, Item 5) from support bracket (Figure 9, Item 8). Discard self-locking nuts (Figure 9, Item 9).

WARNING

All personnel must stand clear during lifting procedures. A swinging or shifting load may cause injury to personnel or damage to equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

18. Position lifting device under cabinet frame (Figure 9, Item 5). Remove 14 self-locking nuts (Figure 9, Item 1), screws (Figure 9, Item 2), and engine and pump cabinet frame (Figure 9, Item 5) from semitrailer. Discard self-locking nuts (Figure 9, Item 1).
19. Lower engine and pump cabinet frame (Figure 9, Item 5) on supports.

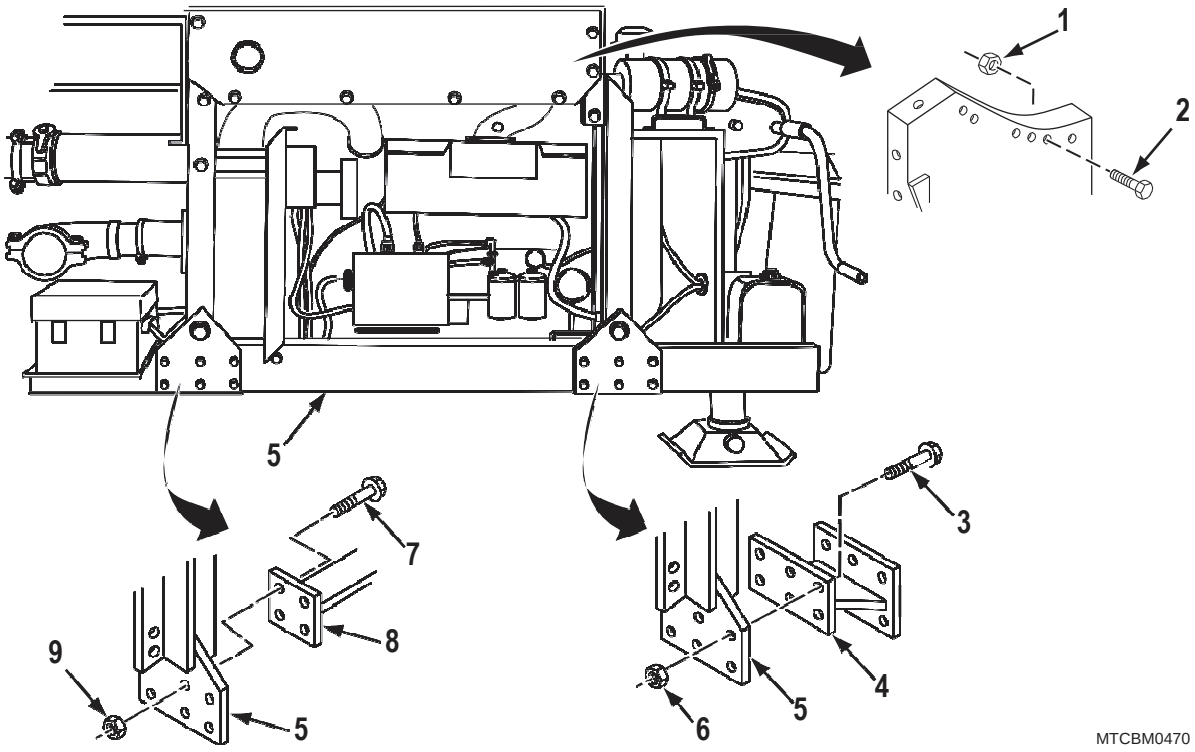
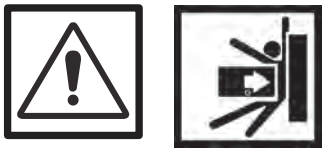


Figure 9. Pump Cabinet Frame Removal.

END OF TASK

INSTALLATION

WARNING



All personnel must stand clear during lifting procedures. A swinging or shifting load may cause injury to personnel or damage to equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Position lifting device under cabinet frame (Figure 10, Item 5).
2. Position cabinet frame (Figure 10, Item 5), with engine and pump assembly under semitrailer. Install 14 screws (Figure 10, Item 2), new self-locking nuts (Figure 10, Item 1), and engine and pump cabinet frame (Figure 10, Item 5) on semitrailer.
3. Install four screws (Figure 10, Item 7) and new self-locking nuts (Figure 10, Item 9) on cabinet frame (Figure 10, Item 5) and support bracket (Figure 10, Item 8).
4. Install six screws (Figure 10, Item 3), new self-locking nuts (Figure 10, Item 6), and support bracket (Figure 10, Item 4) on cabinet frame (Figure 10, Item 5).

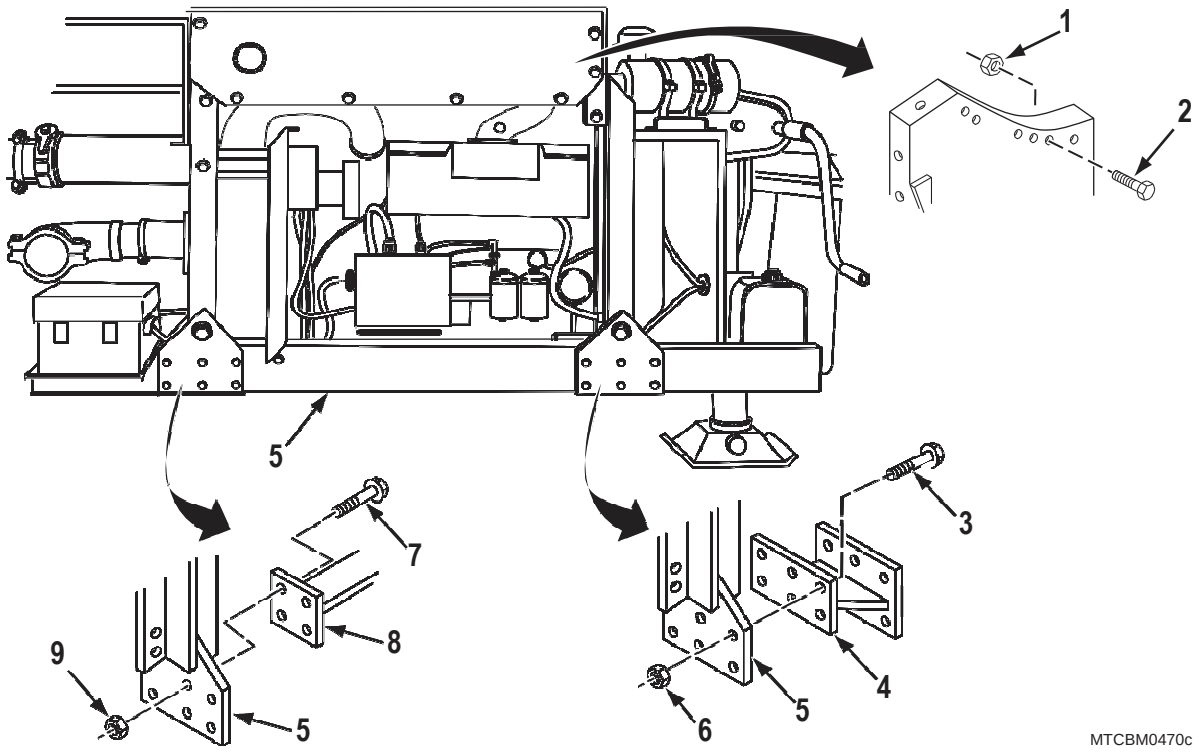


Figure 10. Pump Cabinet Frame Installation.

INSTALLATION - Continued

5. Install gasket (Figure 11, Item 3), elbow (Figure 11, Item 1), and eight new self-locking nuts (Figure 11, Item 2) on pump (Figure 11, Item 4).
6. Install gasket (Figure 11, Item 21), coupling (Figure 11, Item 22), and two screws (Figure 11, Item 23) on outlet tube (Figure 11, Item 16) and elbow (Figure 11, Item 1).
7. Install gasket (Figure 11, Item 5), inlet tube (Figure 11, Item 7), and eight new self-locking nuts (Figure 11, Item 6) on pump (Figure 11, Item 4). Install plug (Figure 11, Item 12), coupling (Figure 11, Item 14), two screws (Figure 11, Item 13), and gasket (Figure 11, Item 15) if removed.
8. Install gasket (Figure 11, Item 10), coupling (Figure 11, Item 9), and two screws (Figure 11, Item 8) on inlet tube (Figure 11, Item 7) and tube (Figure 11, Item 11).
9. Install conduit mounting plate (Figure 11, Item 19), two screws (Figure 11, Item 20), and new self-locking nuts (Figure 11, Item 17) on cabinet frame (Figure 11, Item 18).

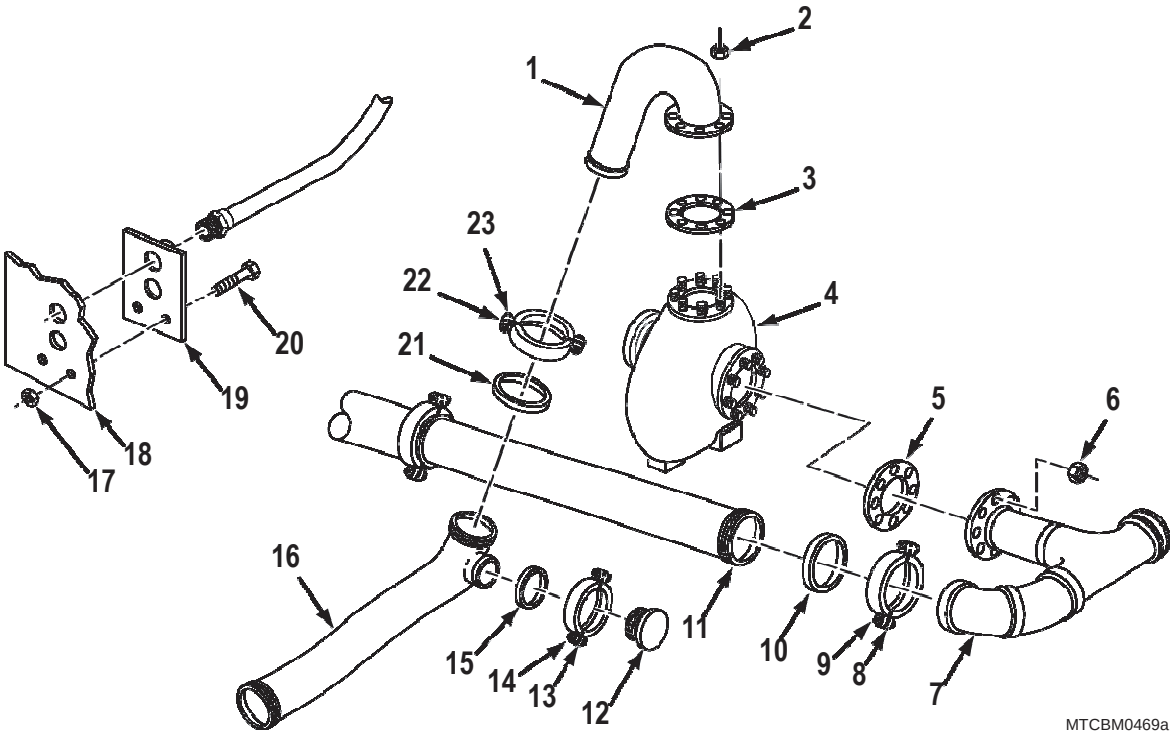


Figure 11. Engine Pump Installation.

INSTALLATION - Continued

10. Install four screws (Figure 12, Item 3), washers (Figure 12, Item 4), and new self-locking nuts (Figure 12, Item 5) on engine fan shroud (Figure 12, Item 2) and on frame (Figure 12, Item 6) and support (Figure 12, Item 1).

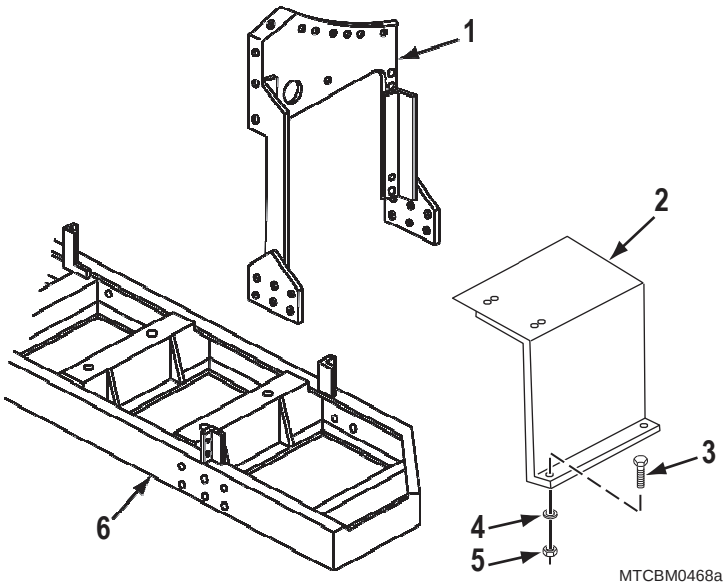


Figure 12. Cabinet Frame Installation.

NOTE

Perform Steps 16 through 19 for Onan engine and Steps 11 through 15 for Lombardini engine.

11. Install throttle cable (Figure 13, Item 1) to governor lever (Figure 13, Item 2) with nut.

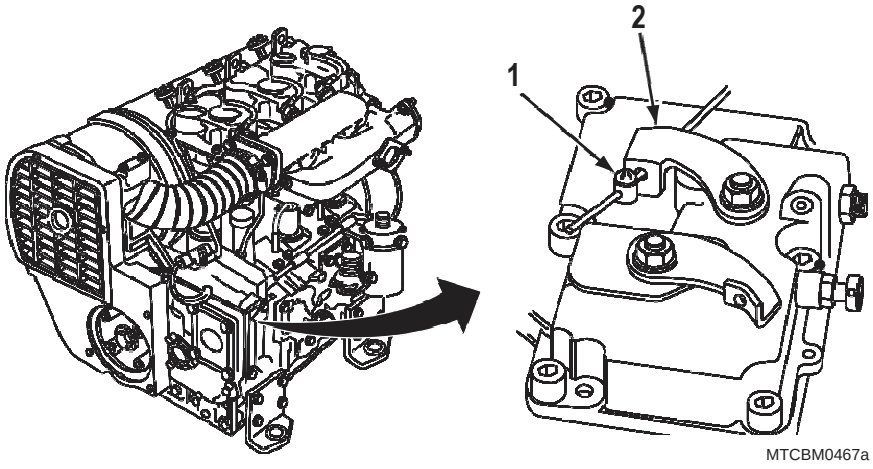


Figure 13. Throttle Cable Installation.

INSTALLATION - Continued

12. Install air restriction tube (Figure 14, Item 2) to air intake manifold (Figure 14, Item 1).

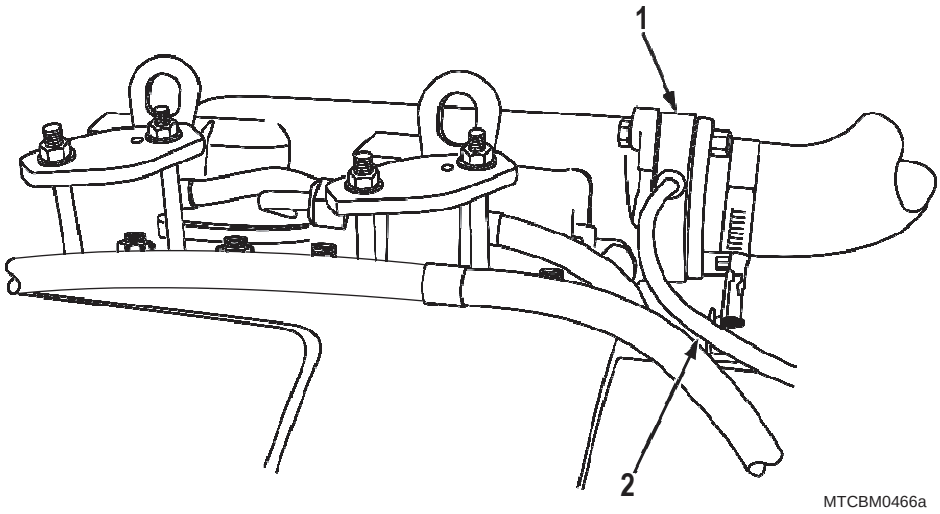


Figure 14. Air Intake Manifold Maintenance.

13. Install lead (Figure 15, Item 1) and nut (Figure 15, Item 2) to starter motor (Figure 15, Item 3).

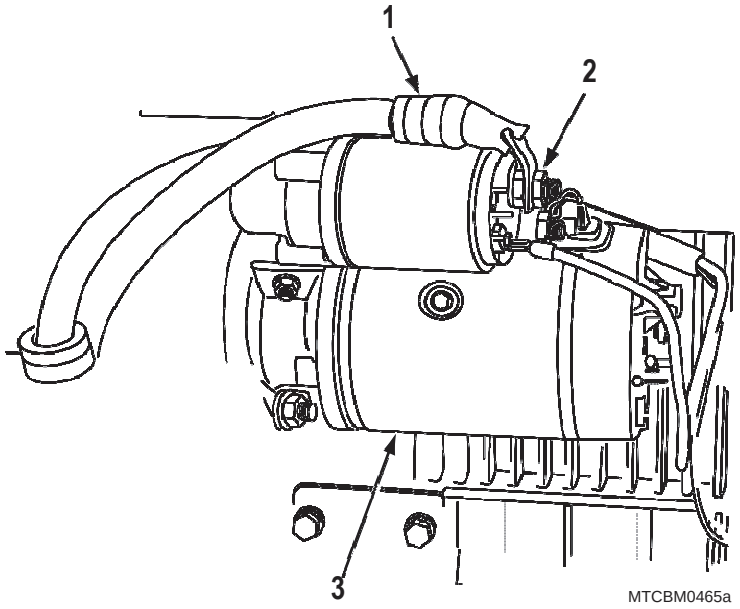


Figure 15. Lead Installation.

INSTALLATION - Continued

14. Connect air restriction tube (Figure 16, Item 2) to air intake manifold (Figure 16, Item 1).

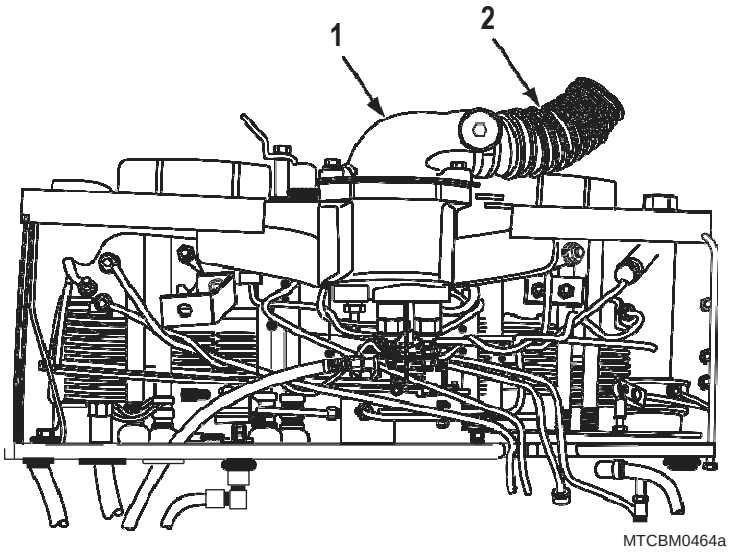


Figure 16. Air Restriction Tube Installation.

15. Connect two electrical leads (Figure 17, Items 2 and 4) to engine electrical box (Figure 17, Item 3).
16. Connect electrical lead (Figure 17, Item 5) to alternator (Figure 17, Item 1).

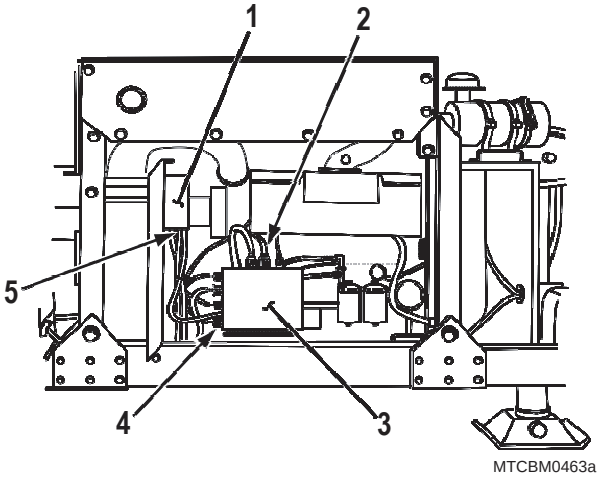


Figure 17. Electrical Lead Installation.

INSTALLATION - Continued

17. Install 1/4 in. (6.35 mm) fuel pressure tube (Figure 18, Item 5) from tee (Figure 18, Item 1) on primary fuel filter (Figure 18, Item 3). Install 1/4 in. (6.35 mm) oil pressure tube (Figure 18, Item 4) on oil adapter (Figure 18, Item 2).

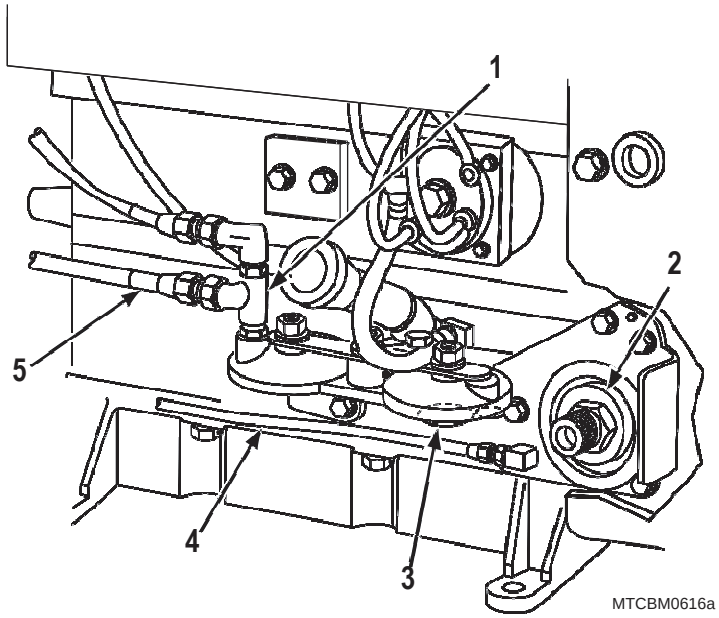


Figure 18. Oil Pressure Tube Installation.

END OF TASK

FOLLOW ON TASK

1. Install piping (WP 0254).
2. Install muffler/exhaust (WP 0213).
3. Connect engine throttle cable (WP 0212).
4. Install curbside hose (WP 0145).
5. Install batteries (WP 0097).
6. Fill fuel tank (WP 0010).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
MANHOLE COVER MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 71)
Washer, Lock

Materials/Parts (cont.)
(WP 0295, Table 1, Item 131)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Semitrailer grounded (WP 0007)
Semitrailer fuel tank drained (WP 0007)

WARNING

To avoid personal injury, ALWAYS relieve pressure in tank shell before opening manhole cover. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

REMOVAL

1. Remove nut (Figure 1, Item 2), washer (Figure 1, Item 3), and bolt (Figure 1, Item 4) from locking ring (Figure 1, Item 1).
2. Remove locking ring (Figure 1, Item 1), manhole cover (Figure 1, Item 6), and manhole cover gasket (Figure 1, Item 5). Discard gasket (Figure 1, Item 5).

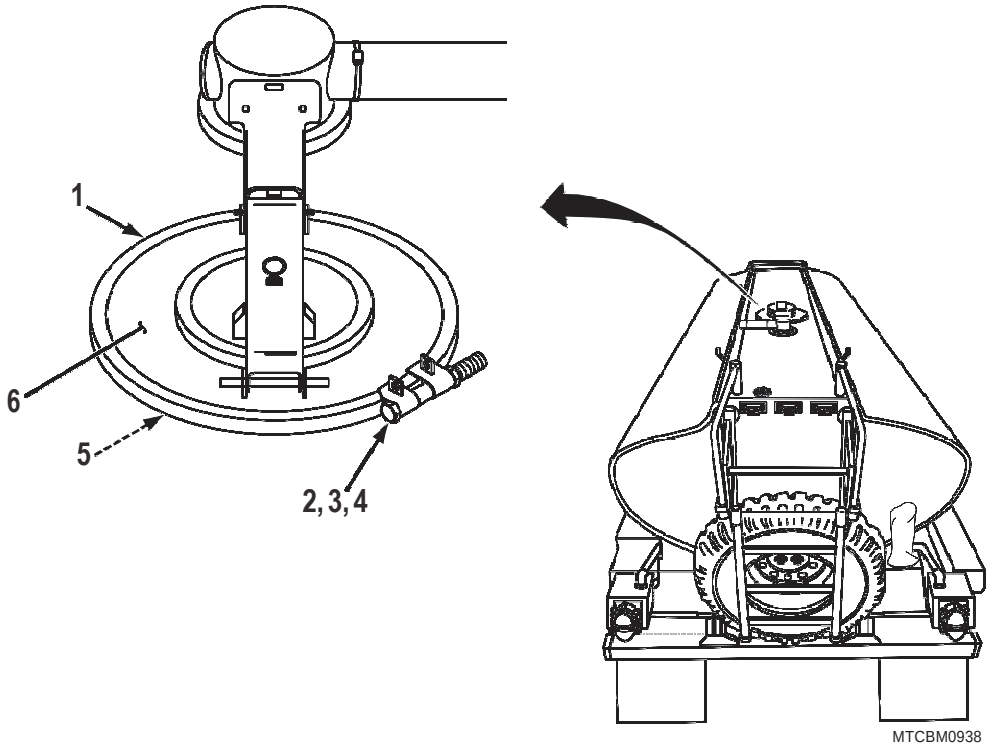


Figure 1. Manhole Cover Removal.

END OF TASK

DISASSEMBLY

1. Remove plug (Figure 2, Item 2) from latch handle (Figure 2, Item 1).
2. Remove nut (Figure 2, Item 3), starwasher (Figure 2, Item 4), socket head capscrew (Figure 2, Item 5), and cylinder (Figure 2, Item 6) from underneath latch handle (Figure 2, Item 1). Discard starwasher (Figure 2, Item 4).

END OF TASK

ASSEMBLY

1. Install cylinder (Figure 2, Item 6), socket head capscrew (Figure 2, Item 5), new starwasher (Figure 2, Item 4), and nut (Figure 2, Item 3) to latch handle (Figure 2, Item 1).
2. Install plug (Figure 2, Item 2) in latch handle (Figure 2, Item 1).

ASSEMBLY - Continued

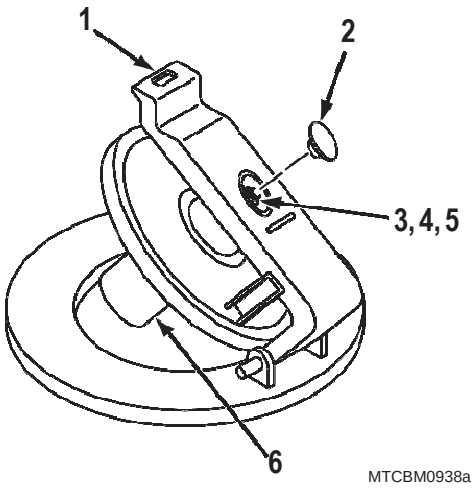


Figure 2. Manhole Cover Maintenance.

END OF TASK

INSTALLATION

1. Install new manhole cover gasket (Figure 1, Item 5), manhole cover (Figure 1, Item 6), and locking ring (Figure 1, Item 1) to tank.
2. Install bolt (Figure 1, Item 4), washer (Figure 1, Item 3), nut (Figure 1, Item 2), and locking ring (Figure 1, Item 1) to manhole cover (Figure 1, Item 6).

END OF TASK

FOLLOW ON TASK

Disconnect semitrailer grounding cables (WP 0007).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
GROUNDING STUD REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

WARNING

- To avoid personal injury, always relieve pressure in tank shell before opening manhole cover. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Ladder has narrow tread. Use care when climbing. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Remove nut (Figure 1, Item 3), lockwasher (Figure 1, Item 2), and grounding stud (Figure 1, Item 1) from frame (Figure 1, Item 4).

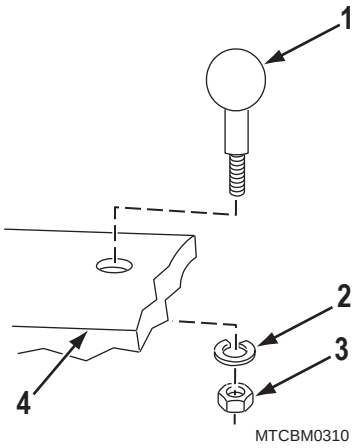


Figure 1. Grounding Stud Removal.

END OF TASK

INSTALLATION

NOTE

Make sure that grounding studs are installed to clean, unpainted, metal surfaces. If mounting surface is painted, scrape off paint to bare metal.

1. Install new grounding stud (Figure 2, Item 1) with lockwasher (Figure 2, Item 2) and nut (Figure 2, Item 3) on frame (Figure 2, Item 4).
2. Ensure International Grounding Symbol (IGS) and "DO NOT PAINT GROUND STUD" stencils are present and legible.

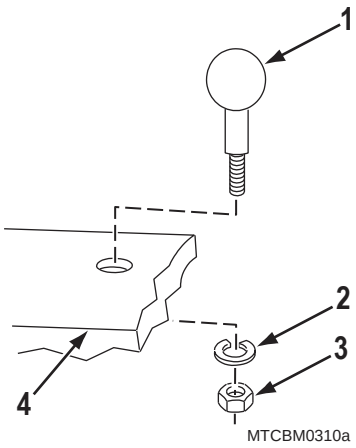


Figure 2. Grounding Stud Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE SPLASH GUARD REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (4) (WP 0295, Table 1, Item 174)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

Remove four bolts (Figure 1, Item 3), self-locking nuts (Figure 1, Item 2), and splash guard (Figure 1, Item 1) from frame. Discard self-locking nuts (Figure 1, Item 2).

END OF TASK

INSTALLATION

Install splash guard (Figure 1, Item 1) on frame with four bolts (Figure 1, Item 3) and new self-locking nuts (Figure 1, Item 2).

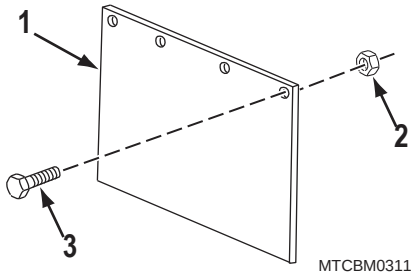


Figure 1. Engine Splash Guard Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
VENT CAP REPAIR

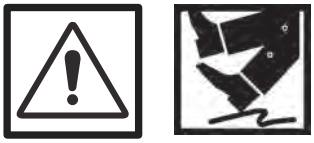
INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

Materials/Parts
Gasket (WP 0295, Table 1, Item 17)
Tape, Antiseize (WP 0293, Table 1, Item 29)

WARNING



- To avoid personal injury, always relieve pressure in tank shell before opening manhole cover. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Ladder has narrow tread. Use care when climbing. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Semitrailers have more than one vent cap. Use this task to replace any vent cap.

DISASSEMBLY

1. Remove vent cap (Figure 1, Item 4) from pipe nipple (Figure 1, Item 6).
2. Remove screw (Figure 1, Item 1), S-hook (Figure 1, Item 2), and chain (Figure 1, Item 3) from vent cap (Figure 1, Item 4).
3. Remove gasket (Figure 1, Item 5) from vent cap (Figure 1, Item 4).

END OF TASK

ASSEMBLY

1. Install new gasket (Figure 1, Item 5) inside vent cap (Figure 1, Item 4).
2. Install screw (Figure 1, Item 1), S-hook (Figure 1, Item 2) and chain (Figure 1, Item 3) on vent cap (Figure 1, Item 4).
3. Apply antiseize tape to threads of pipe nipple (Figure 1, Item 6) and install vent cap (Figure 1, Item 4) on pipe nipple (Figure 1, Item 6).

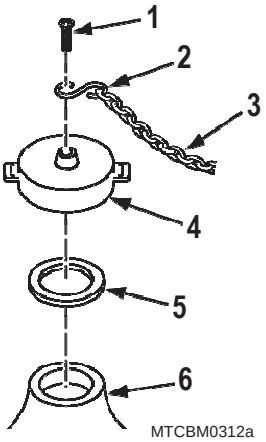


Figure 1. Vent Cap Assembly.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
SPARE TIRE LIFTING DEVICE, LADDER, AND DRAIN PIPE REPLACEMENT (M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Coupling, Pipe
Qty: (2) (WP 0295, Table 1, Item 89)
Nut, Self-Locking
Qty: (8) (WP 0295, Table 1, Item 164)
Nut, Self-Locking
Qty: (8) (WP 0295, Table 1, Item 161)
Nut, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 159)
Washer, Lock
Qty: (2) (WP 0295, Table 1, Item 56)
Washer, Lock
Qty: (4) (WP 0295, Table 1, Item 94)
Washer, Lock
Qty: (4) (WP 0295, Table 1, Item 194)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Semitrailer bonded and grounded (WP 0008)
Spare tire removed

REMOVAL

1. Remove eight self-locking nuts (Figure 1, Item 4), washers (Figure 1, Item 5), four U-bolts (Figure 1, Item 6), and bracket (Figure 1, Item 3) from two front drain pipes (Figure 1, Item 2). Discard self-locking nuts (Figure 1, Item 4).
2. Remove two self-locking nuts (Figure 1, Item 7), washers (Figure 1, Item 8), and screws (Figure 1, Item 9) from bottom of two front drain pipes (Figure 1, Item 2). Discard self-locking nuts (Figure 1, Item 7).
3. Remove four nuts (Figure 1, Item 10), screws (Figure 1, Item 1), two pipe clamp couplings (Figure 1, Item 11), and two front drain pipes (Figure 1, Item 2) from semitrailer. Discard pipe clamp couplings (Figure 1, Item 11).

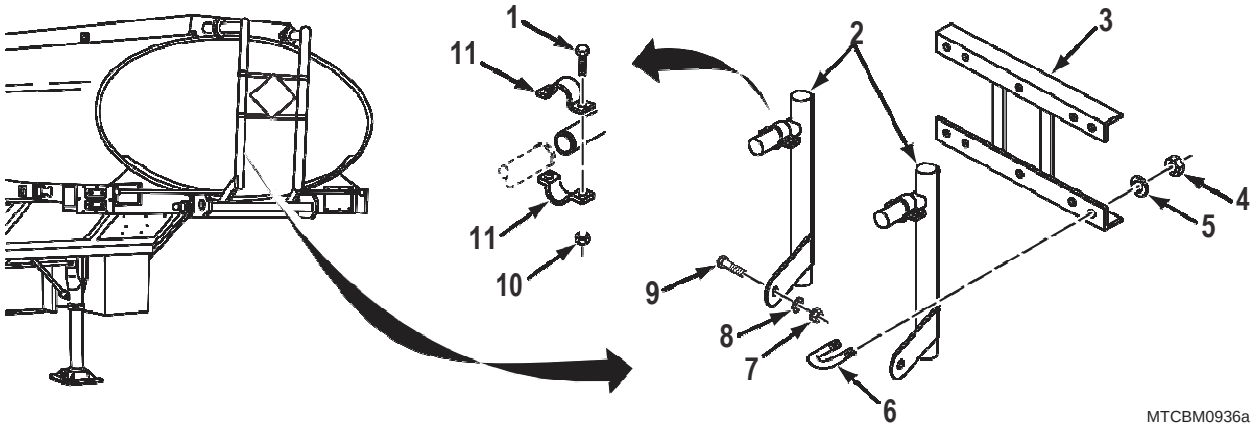


Figure 1. Hazardous Placard Bracket Removal.

REMOVAL - Continued

4. Remove two self-locking nuts (Figure 2, Item 9), washers (Figure 2, Item 10), and screws (Figure 2, Item 11) from two handrails (Figure 2, Item 5). Discard self-locking nuts (Figure 2, Item 9).
5. Remove two self-locking nuts (Figure 2, Item 8), washers (Figure 2, Item 7), screws (Figure 2, Item 6), and two handrails (Figure 2, Item 5) from semitrailer. Discard self-locking nuts (Figure 2, Item 8).

NOTE

Self-locking nut is provisioned with handle extension.

6. Remove self-locking nut (Figure 2, Item 29) and screw (Figure 2, Item 31) from winch adapter (Figure 2, Item 30) and handle extension (Figure 2, Item 32).
7. Remove handle extension (Figure 2, Item 32) and bushing (Figure 2, Item 33) from support (Figure 2, Item 36).
8. Remove two nuts (Figure 2, Item 34), lockwashers (Figure 2, Item 35), washers (Figure 2, Item 37), and screws (Figure 2, Item 38) from support (Figure 2, Item 36). Discard lockwashers (Figure 2, Item 35).
9. Remove four nuts (Figure 2, Item 15), lockwashers (Figure 2, Item 16), washers (Figure 2, Item 18), screws (Figure 2, Item 19), and two pivot brackets (Figure 2, Item 17) from semitrailer. Discard lockwashers (Figure 2, Item 16).
10. Remove two pivot brackets (Figure 2, Item 17) from spare tire lifting device ladder (Figure 2, Item 14).
11. Remove two quick-release pins (Figure 2, Item 13), wire ropes (Figure 2, Item 12), and ladder (Figure 2, Item 14) from semitrailer.
12. Remove four nuts (Figure 2, Item 28), lockwashers (Figure 2, Item 27), screws (Figure 2, Item 24), washers (Figure 2, Item 25), and two rubber stops (Figure 2, Item 26) from two back drain pipes (Figure 2, Item 23). Discard lockwashers (Figure 1, Item 27).
13. Remove two self-locking nuts (Figure 2, Item 22), screws (Figure 2, Item 20), washers (Figure 2, Item 21), and two back drain pipes (Figure 2, Item 23) from semitrailer. Discard self-locking nuts (Figure 2, Item 22).
14. Remove two self-locking nuts (Figure 2, Item 2), four washers (Figure 2, Item 3), two screws (Figure 2, Item 4), and step (Figure 2, Item 1) from semitrailer. Discard self-locking nuts (Figure 2, Item 2).

REMOVAL - Continued

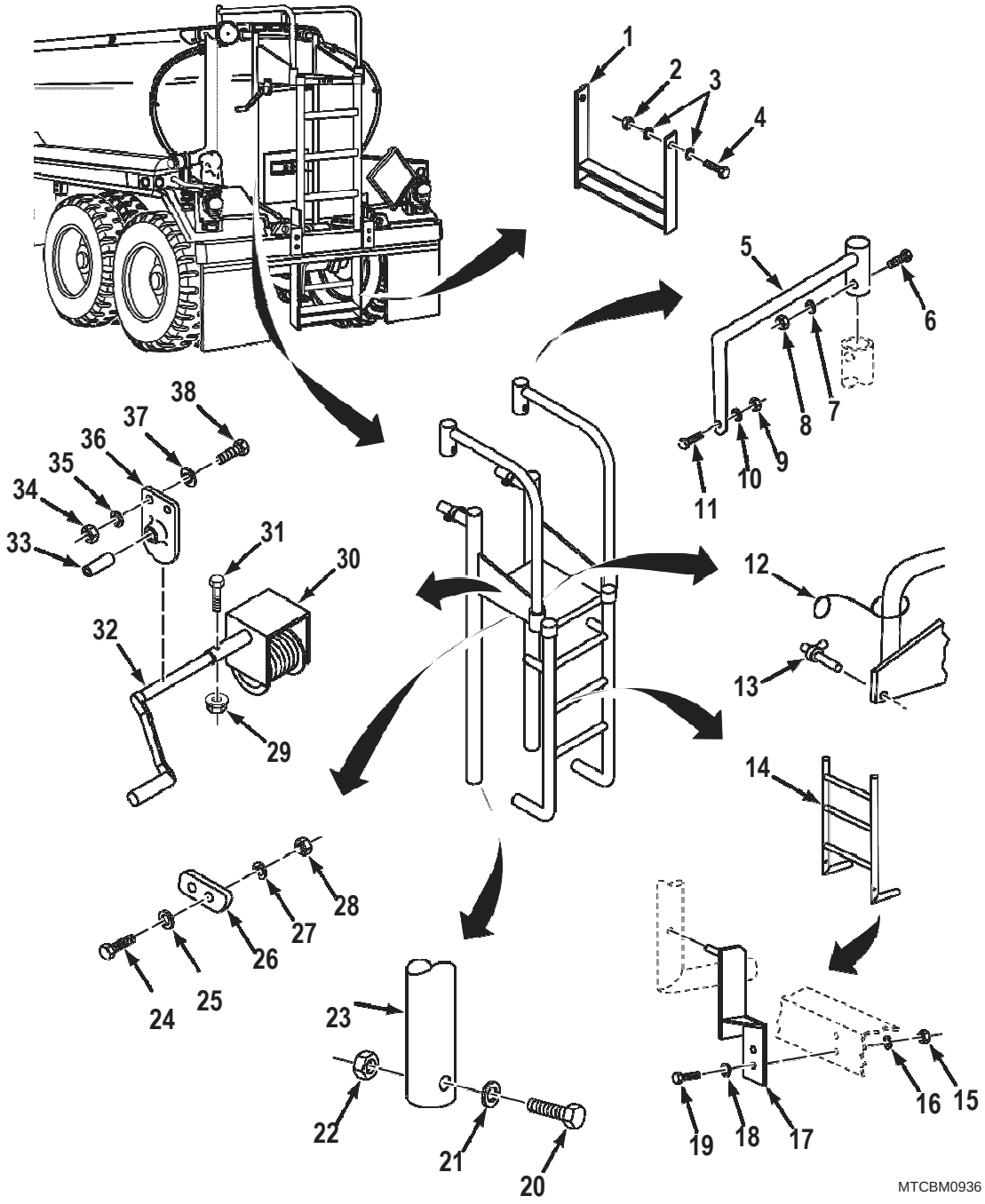


Figure 2. Spare Tire and Lifting Device Removal.

END OF TASK

INSTALLATION

1. Install step (Figure 3, Item 1) on semitrailer with two screws (Figure 3, Item 4), four washers (Figure 3, Item 3), and two new self-locking nuts (Figure 3, Item 2).
2. Install two back drain pipes (Figure 3, Item 23) on semitrailer with two screws (Figure 3, Item 20), washers (Figure 3, Item 21), and new self-locking nuts (Figure 3, Item 22).
3. Install two rubber stops (Figure 3, Item 26) on two back drain pipes (Figure 3, Item 23) with four screws (Figure 3, Item 24), washers (Figure 3, Item 25), new lockwashers (Figure 3, Item 27), and nuts (Figure 3, Item 28).
4. Install spare tire lifting device ladder (Figure 3, Item 14) on ladder with two quick-release pins (Figure 3, Item 13) and two wire ropes (Figure 3, Item 12).
5. Install two pivot brackets (Figure 3, Item 17) on ladder (Figure 3, Item 14).
6. Install two pivot brackets (Figure 3, Item 17) on semitrailer with four screws (Figure 3, Item 19), washers (Figure 3, Item 18), new lockwashers (Figure 3, Item 16), and nuts (Figure 3, Item 15).
7. Install support (Figure 3, Item 36) on semitrailer with four screws (Figure 3, Item 38), washers (Figure 3, Item 37), new lockwashers (Figure 3, Item 35), and nuts (Figure 3, Item 34).
8. Align handle extension (Figure 3, Item 32) and bushing (Figure 3, Item 33) in support (Figure 3, Item 36).
9. Install handle extension (Figure 3, Item 32) on winch adapter (Figure 3, Item 30) with screw (Figure 3, Item 31) and self-locking nut (Figure 3, Item 29).
10. Install two upper handrails (Figure 3, Item 5) on semitrailer with two screws (Figure 3, Item 6), washers (Figure 3, Item 7), and new self-locking nuts (Figure 3, Item 8).
11. Install two screws (Figure 3, Item 11), washers (Figure 3, Item 10), and new self-locking nuts (Figure 3, Item 9) on two upper handrails (Figure 3, Item 5).

INSTALLATION - Continued

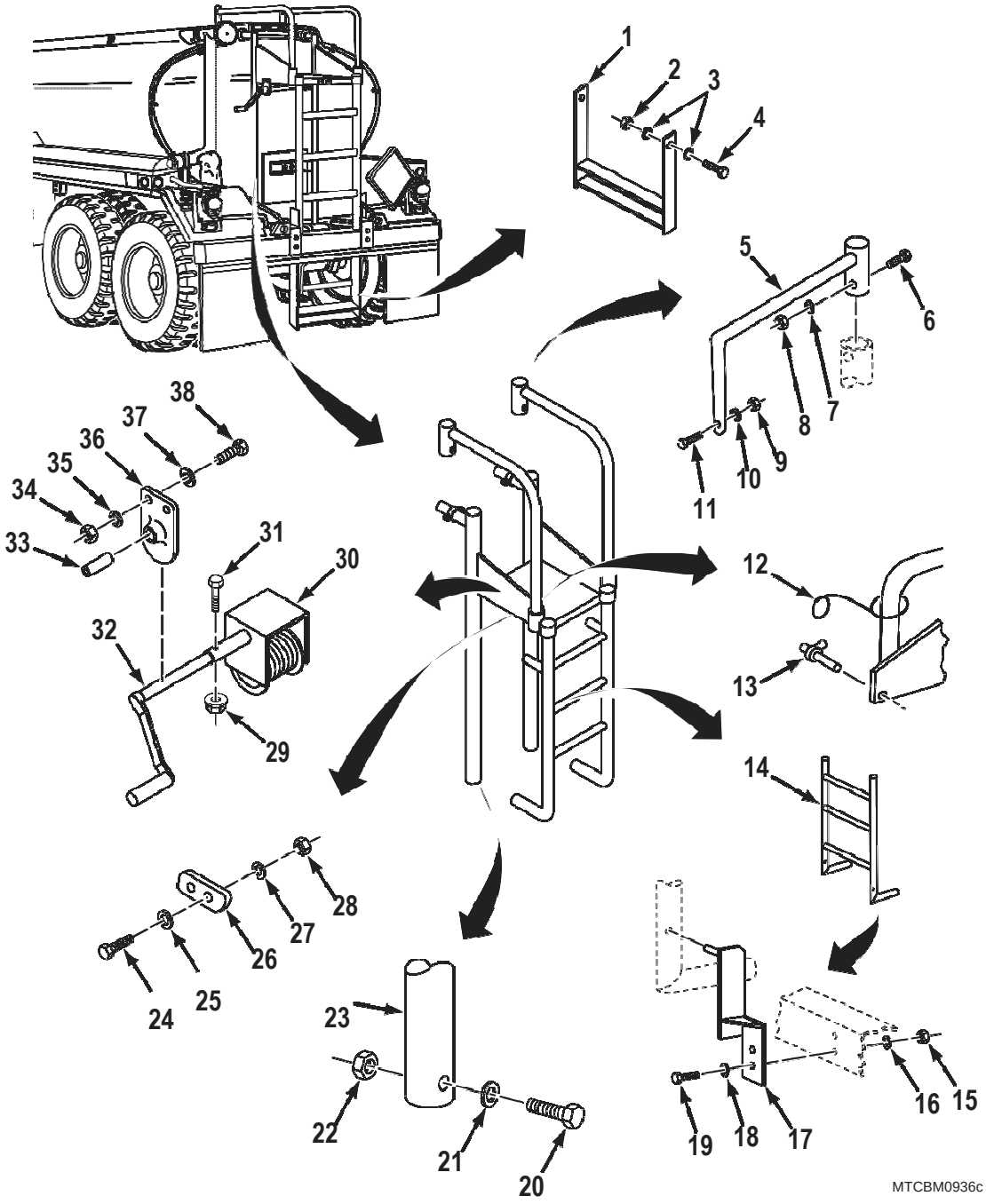


Figure 3. Spare Tire and Lifting Device Installation.

INSTALLATION - Continued

12. Install two front drain pipes (Figure 4, Item 2) on semitrailer with two new pipe clamp couplings (Figure 4, Item 11), four screws (Figure 4, Item 1), and nuts (Figure 4, Item 10).
13. Install two screws (Figure 4, Item 9), washers (Figure 4, Item 8), and new self-locking nuts (Figure 4, Item 7) on bottom of two front drain pipes (Figure 4, Item 2).
14. Install bracket (Figure 4, Item 3) on two front drain pipes (Figure 4, Item 2) with four U-bolts (Figure 4, Item 6), eight washers (Figure 4, Item 5), and eight new self-locking nuts (Figure 4, Item 4).

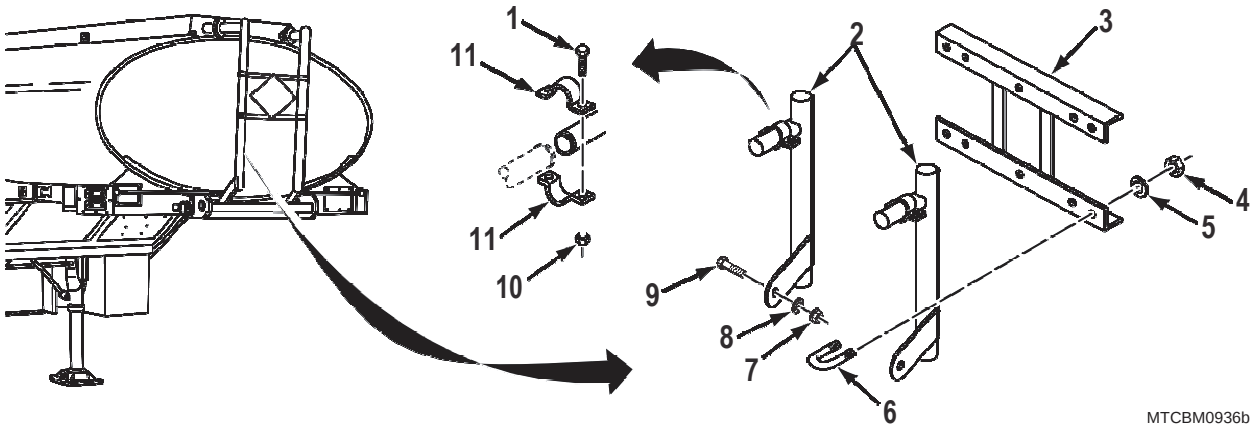


Figure 4. Hazardous Placard Bracket Installation.

END OF TASK

FOLLOW ON TASK

1. Disconnect ground (WP 0008).
2. Install front hazardous materials placard (WP 0175).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LADDER AND DRAIN PIPE REPLACEMENT (M967A1, M969A1, AND M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 163)
Nut, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 159)
Nut, Self-Locking
Qty: (8) (WP 0295, Table 1, Item 161)
Nut, Self-Locking
Qty: (8) (WP 0295, Table 1, Item 126)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Semitrailer bonded and grounded (WP 0008)
Spare tire removed

REMOVAL

1. Remove eight self-locking nuts (Figure 1, Item 5), flatwashers (Figure 1, Item 6) and four U-bolts (Figure 1, Item 11) from bracket. Discard self-locking nuts (Figure 1, Item 5).
2. Remove two screws (Figure 1, Item 8), washers (Figure 1, Item 9), and self-locking nuts (Figure 1, Item 10) from bottom of front drain pipes (Figure 1, Item 12). Discard self-locking nuts (Figure 1, Item 10).
3. Remove four screws (Figure 1, Item 1), flatwashers (Figure 1, Item 3), pipe clamp halves (Figure 1, Item 2), and self-locking nuts (Figure 1, Item 4) from top of front drain pipes (Figure 1, Item 12). Discard self-locking nuts (Figure 1, Item 4).
4. Remove front drain pipes (Figure 1, Item 8).

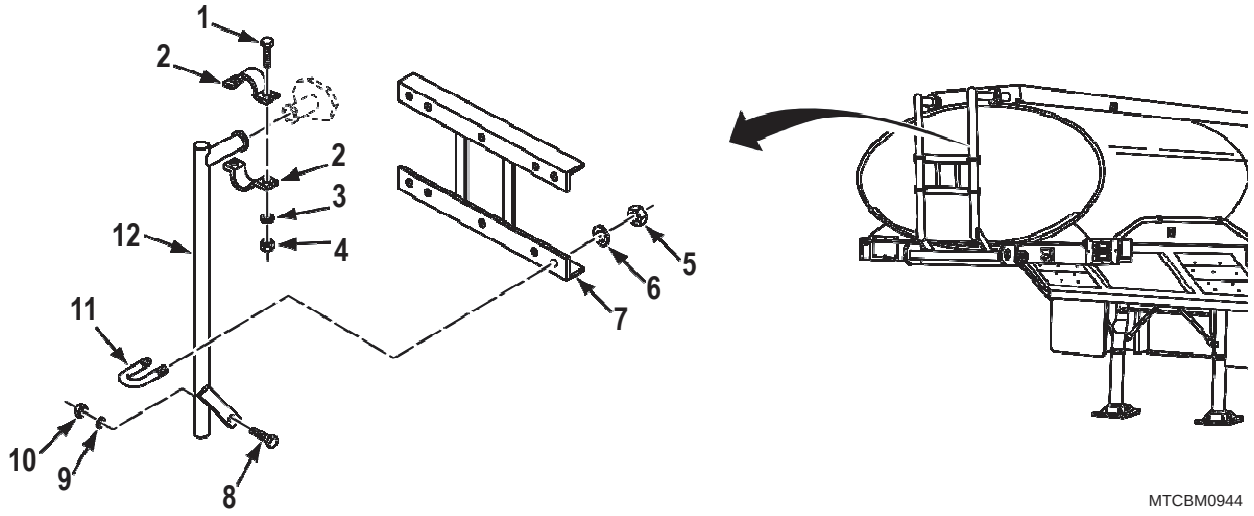


Figure 1. Front Drain Pipes Removal.

REMOVAL - Continued

5. Remove two quick-release pins (Figure 2, Item 15) from bottom of ladder (Figure 2, Item 18).
6. Remove two screws (Figure 2, Item 4), flatwashers (Figure 2, Item 3), and self-locking nuts (Figure 2, Item 2) from handrails (Figure 2, Item 1).
7. Remove two screws (Figure 2, Item 10), flatwashers (Figure 2, Item 16), and self-locking nuts (Figure 2, Item 17) from bottom of rear drain pipes (Figure 2, Item 9). Discard self-locking nuts (Figure 2, Item 17).
8. Remove four screws (Figure 2, Item 5), flatwashers (Figure 2, Item 7), pipe clamp halves (Figure 2, Item 6), and self-locking nuts (Figure 2, Item 8) from top of rear drain pipes (Figure 2, Item 9). Discard self-locking nuts (Figure 2, Item 8).
9. Remove two screws (Figure 2, Item 13), four flatwashers (Figure 2, Item 12), two self-locking nuts (Figure 2, Item 11), and step (Figure 2, Item 14) from semitrailer.
10. Remove rear drain pipes (Figure 2, Item 9), ladder (Figure 2, Item 18), and hand rails (Figure 2, Item 1) from semitrailer.

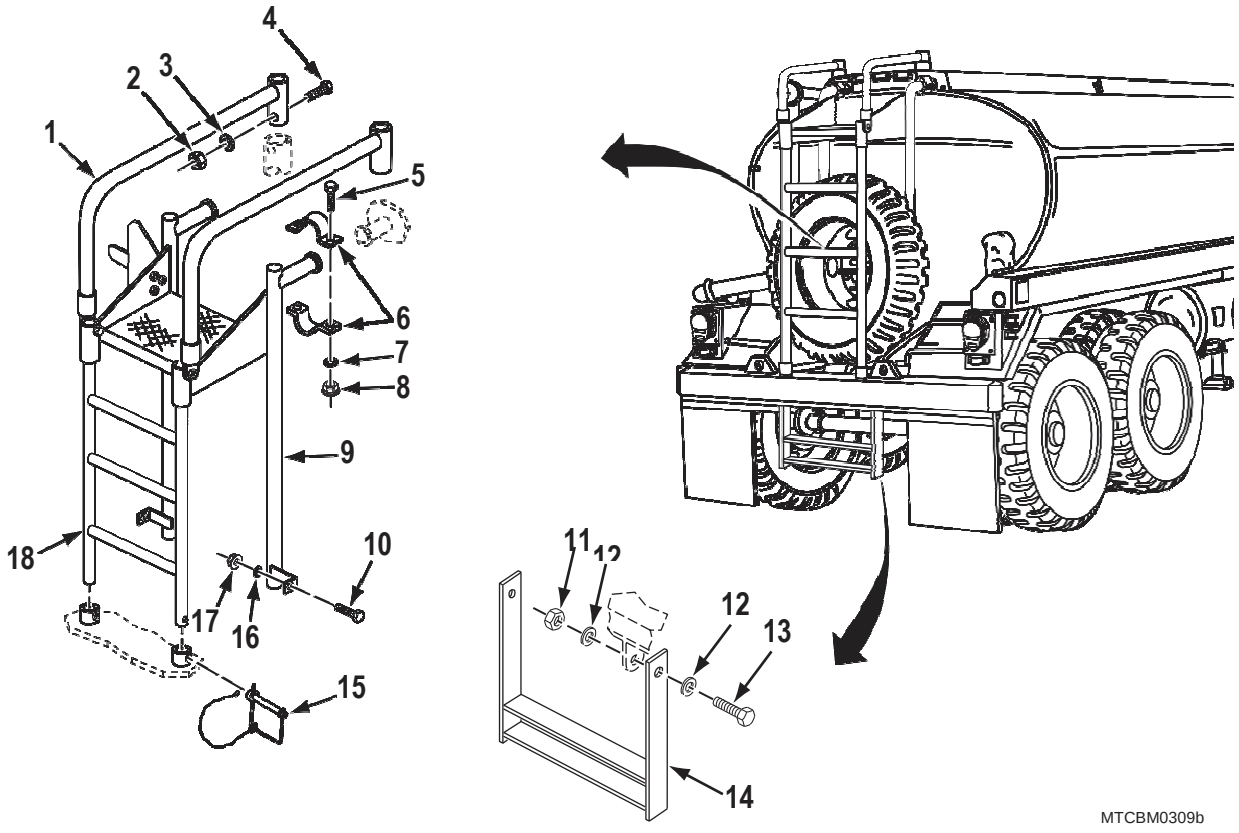


Figure 2. Ladder and Drain Pipe Replacement.

END OF TASK

INSTALLATION

1. Install hand rails (Figure 2, Item 1), ladder (Figure 2, Item 18), and rear drain pipes (Figure 2, Item 9) on semitrailer.

INSTALLATION - Continued

2. Install step (Figure 2, Item 14) on semitrailer with two screws (Figure 2, Item 13), four washers (Figure 2, Item 12), and two self-locking nuts (Figure 2, Item 11).
3. Install four screws (Figure 2, Item 5), flatwashers (Figure 2, Item 7), pipe clamp halves (Figure 2, Item 6), and new self-locking nuts (Figure 2, Item 8) on top of rear drain pipes (Figure 2, Item 9).
4. Install two screws (Figure 2, Item 10), flatwashers (Figure 2, Item 16), and new self-locking nuts (Figure 2, Item 17) on bottom of rear drain pipes (Figure 2, Item 9).
5. Install two screws (Figure 2, Item 4), flatwashers (Figure 2, Item 3), and self-locking nuts (Figure 2, Item 2) on handrails (Figure 2, Item 1).
6. Install two quick-release pins (Figure 2, Item 15) on bottom of ladder (Figure 2, Item 18).
7. Install front drain pipes (Figure 3, Item 12) on semitrailer.
8. Install four screws (Figure 3, Item 1), flatwashers (Figure 3, Item 3), pipe clamp halves (Figure 3, Item 2), and new self-locking nuts (Figure 3, Item 4) on top of front drain pipes (Figure 3, Item 12).
9. Install two screws (Figure 3, Item 8), flatwashers (Figure 3, Item 9), and new self-locking nuts (Figure 3, Item 10) on bottom of front drain pipes (Figure 3, Item 12).
10. Install bracket on semitrailer with four U-bolts (Figure 3, Item 11), eight flatwashers (Figure 3, Item 6), and new self-locking nuts (Figure 1, Item 5).

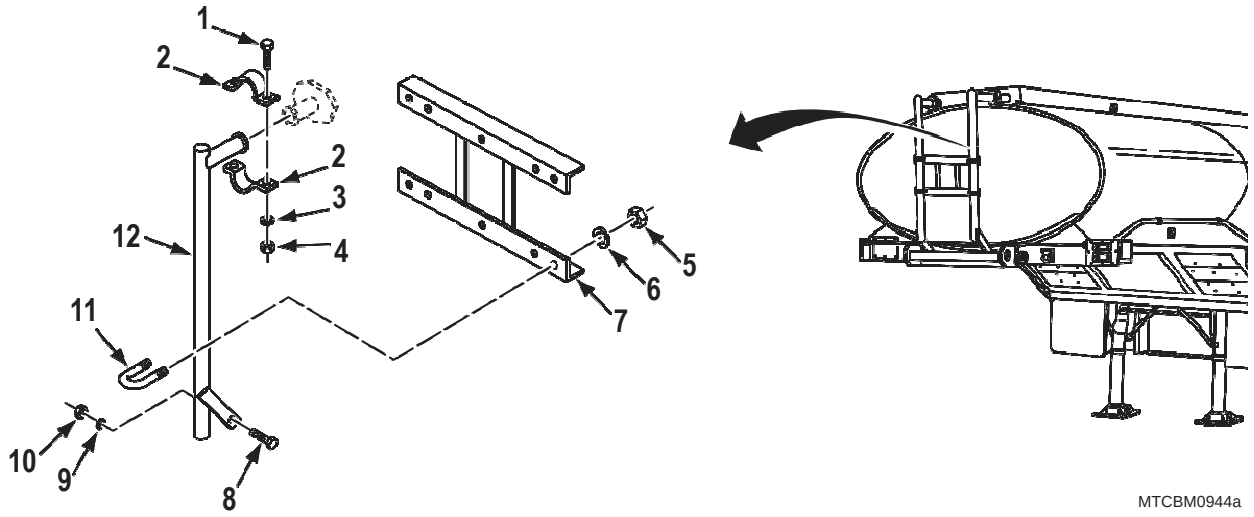


Figure 3. Front Drain Pipes Installation.

END OF TASK

FOLLOW ON TASK

Install spare tire.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
DECAL REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Materials/Parts
Rag, Wiping (WP 0293, Table 1, Item 20)
Solvent, Cleaning Compound
(WP 0293, Table 1, Item 25)

DECAL REPLACEMENT

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

DECAL REPLACEMENT - Continued

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Use solvent to loosen damaged decal and remove decal from surface. Discard decal.
2. Clean any decal residue from surface with solvent. Wipe surface with clean dry rag.
3. Let surface dry thoroughly.
4. Remove protective backing from new decal and position on surface.
5. Using a clean dry rag, press decal into position. Start in the center of decal and press outward to remove any air bubbles.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
IDENTIFICATION AND INSTRUCTION PLATES REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Drill, Electric, Portable (WP 0294, Table 1, Item 7)
Drill Set, Twist (WP 0294, Table 1, Item 8)
Riveter, Blind, Hand (WP 0294, Table 1, Item 17)

Materials/Parts
Rivet, Blind
Qty: (4) (WP 0295, Table 1, Item 158)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

NOTE

If the instruction plates have been mounted with bolts and nuts, replace with rivets.

Remove four rivets or screws (Figure 1, Item 3), self-locking nuts (Figure 1, Item 2), and instruction plate (Figure 1, Item 1) from semitrailer. Discard screws (Figure 1, Item 3) and self-locking nuts (Figure 1, Item 2).

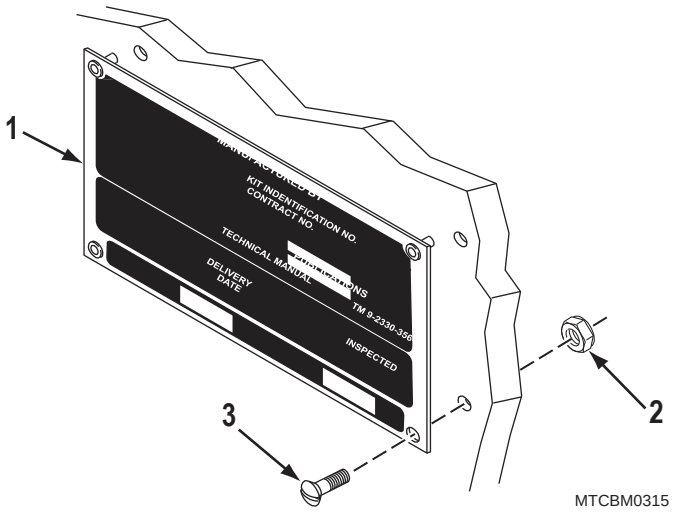


Figure 1. Identification and Instruction Plate Removal.

END OF TASK

INSTALLATION

Install plate (Figure 2, Item 1) on semitrailer with four rivets (Figure 2, Item 2).

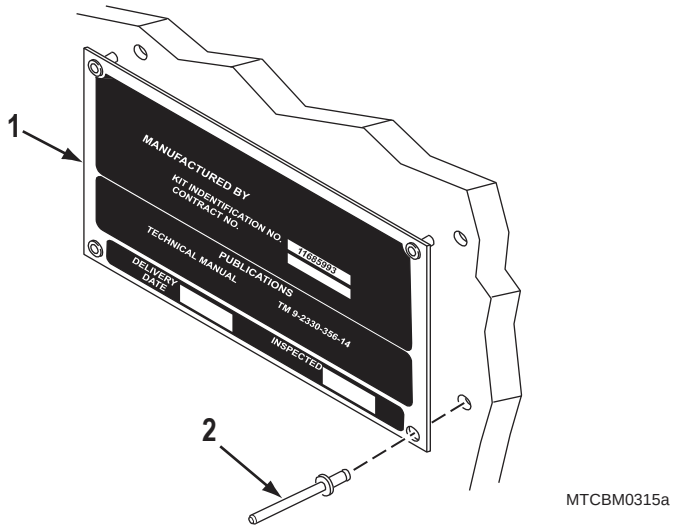


Figure 2. Identification and Instruction Plate Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
REFLECTOR REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Materials/Parts
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (2) (WP 0295, Table 1, Item 161)
Rag, Wiping (WP 0293, Table 1, Item 20)
Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)

Equipment Condition
Semitrailer uncoupled WP 0007

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

NOTE

For proper installation of reflector, note its location before removing. If reflectors are attached with adhesive, perform Steps 1 and 2. If they are attached with screws, go to Step 3.

1. Remove reflector from semitrailer. Discard reflector (Figure 1, Item 3).
2. Clean any adhesive residue from semitrailer with degreasing solvent. Wipe surface with clean dry rag.
3. Remove two bolts (Figure 1, Item 4), washers (Figure 1, Item 2), self-locking nuts (Figure 1, Item 1), and reflector (Figure 1, Item 3) from semitrailer. Discard self-locking nuts (Figure 1, Item 1).

END OF TASK

INSTALLATION

NOTE

Surface must be clean and dry before installing new reflector. If reflectors are attached with adhesive proceed to Steps 1 and 2. If they are attached with screws, go to Step 3.

1. Remove protective backing from new reflector (Figure 1, Item 3) and position on semitrailer.
2. Using a clean dry rag, press reflector (Figure 1, Item 3) into position. Start in the center of reflector and press outward to remove any air bubbles.
3. Secure reflector (Figure 1, Item 3) with two new self-locking nuts (Figure 1, Item 1), washers (Figure 1, Item 2), and bolts (Figure 1, Item 4).

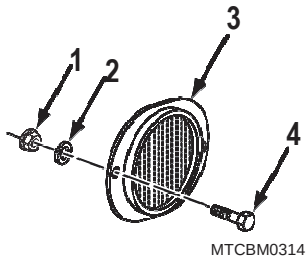


Figure 1. Reflector Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HAZARDOUS PLACARD AND BRACKET REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (12) (WP 0295, Table 1, Item 201)
Nut, Self-Locking
Qty: (12) (WP 0295, Table 1, Item 202)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Semitrailer bonded and grounded (WP 0007)

NOTE

All hazardous materials placards are removed and installed from brackets the same way. One placard is shown here. Brackets are different on rear, curb-side, and roadside of semitrailer.

REMOVAL

1. Remove four screws (Figure 1, Item 1), self-locking nuts (Figure 1, Item 5), eight washers (Figure 1, Item 2), and hazard materials placard (Figure 1, Item 3) from bracket (Figure 1, Item 4). Discard self-locking nuts (Figure 1, Item 5).
2. Remove four self-locking nuts (Figure 1, Item 6), eight washers (Figure 1, Item 7), four screws (Figure 1, Item 9), and placard (Figure 1, Item 3) from support (Figure 1, Item 8) on front of semitrailer.
3. Remove four screws (Figure 1, Item 10), washers (Figure 1, Item 11), self-locking nuts (Figure 1, Item 12), and bracket (Figure 1, Item 4) from rear of semitrailer. Discard self-locking nuts (Figure 1, Item 12).
4. Remove six screws (Figure 1, Item 15), washers (Figure 1, Item 14), self-locking nuts (Figure 1, Item 13), and bracket (Figure 1, Item 4) from curbside of semitrailer. Discard self-locking nuts (Figure 1, Item 13).
5. Remove six self-locking nuts (Figure 1, Item 19), washers (Figure 1, Item 18), support (Figure 1, Item 17), plate (Figure 1, Item 16), and bracket (Figure 1, Item 4) from roadside of semitrailer. Discard self-locking nuts (Figure 1, Item 19).

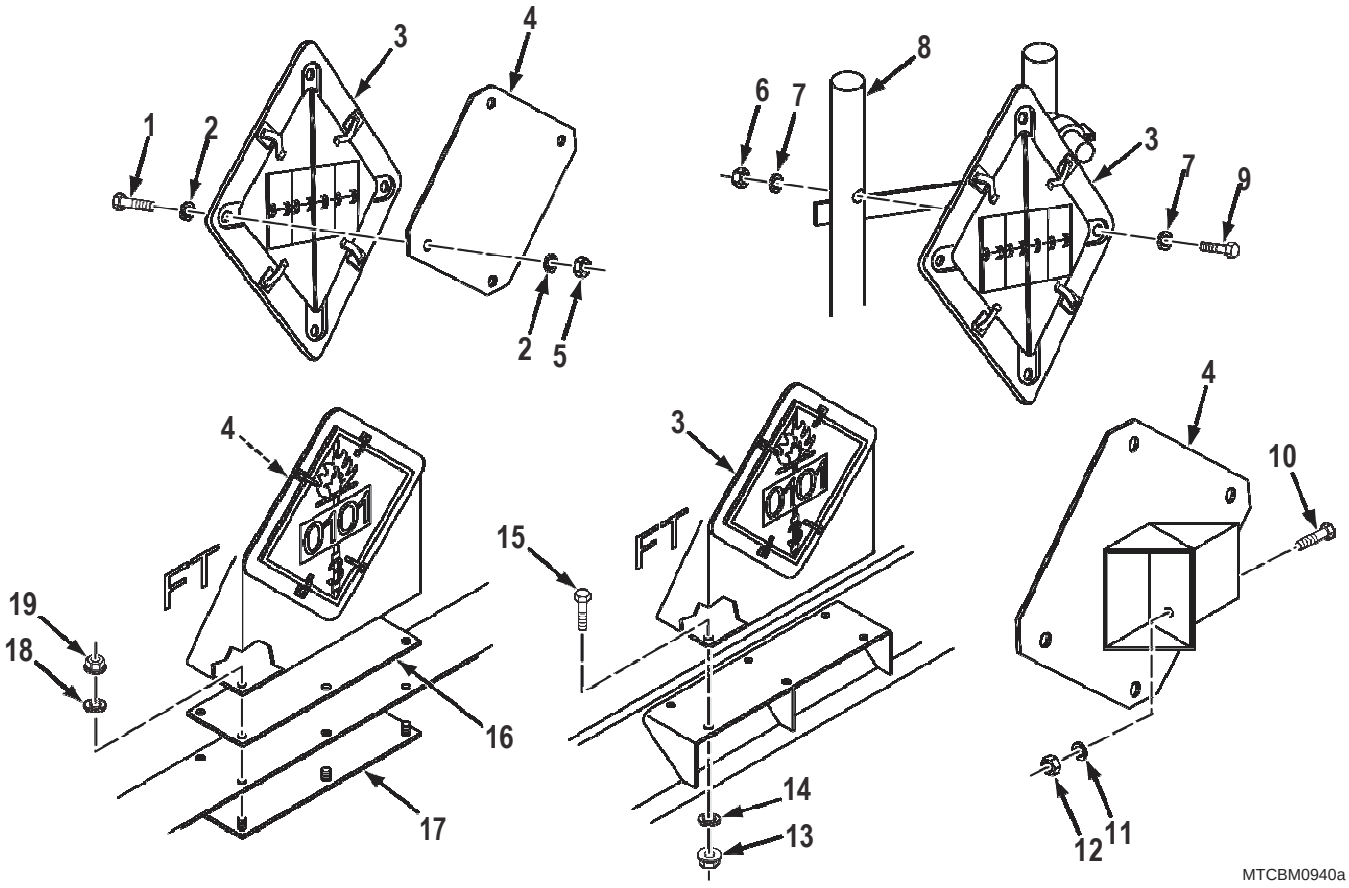


Figure 1. Hazardous Materials Placard and Bracket Replacement.

END OF TASK

INSTALLATION

1. Install bracket (Figure 1, Item 4), plate (Figure 1, Item 16), and support (Figure 1, Item 17) on roadside of semitrailer with six new self-locking nuts (Figure 1, Item 19) and washers (Figure 1, Item 18).
2. Install bracket (Figure 1, Item 4) on curbside of semitrailer with three screws (Figure 1, Item 15), washers (Figure 1, Item 14), and new self-locking nuts (Figure 1, Item 13).
3. Install bracket (Figure 1, Item 4) on rear of semitrailer with four screws (Figure 1, Item 10), washers (Figure 1, Item 11), and new self-locking nuts (Figure 1, Item 12).
4. Install hazardous materials placard (Figure 1, Item 3) on support (Figure 1, Item 8) with four screws (Figure 1, Item 9), eight washers (Figure 1, Item 7), and four new self-locking nuts (Figure 1, Item 6).
5. Install placard (Figure 1, Item 3) on bracket (Figure 1, Item 4) with four screws (Figure 1, Item 1), eight washers (Figure 1, Item 2), and four new self-locking nuts (Figure 1, Item 5).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Materials/Parts
- Lubricating Oil (WP 0293, Table 1, Item 17)
- Nut, Self-Locking
  Qty: (5) (WP 0295, Table 1, Item 166)
- Nut, Self-Locking
  Qty: (10) (WP 0295, Table 1, Item 161)
- Nut, Self-Locking
  Qty: (16) (WP 0295, Table 1, Item 173)
- Sealant, Adhesive (WP 0293, Table 1, Item 21)

Materials/Parts (cont.)
- Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)
- Washer, Lock
  Qty: (6) (WP 0295, Table 1, Item 109)
- Washer, Lock
  Qty: (8) (WP 0295, Table 1, Item 149)

Equipment Condition
- Semitrailer uncoupled (WP 0007)
- Engine and pump cabinet removed (WP 0165)
- Engine electrical box removed (WP 0224)
- Fuel stop solenoid removed (WP 0225)
- Muffler and exhaust pipe removed (WP 0213)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove 10 screws (Figure 1, Item 9), self-locking nuts (Figure 1, Item 3), 20 washers (Figure 1, Item 1), and firewall (Figure 1, Item 2) from two support brackets (Figure 1, Item 5). Discard self-locking nuts (Figure 1, Item 3).
2. Remove five self-locking nuts (Figure 1, Item 6), washers (Figure 1, Item 7), screws (Figure 1, Item 8), and muffler tray (Figure 1, Item 4) from two support brackets (Figure 1, Item 5). Discard self-locking nuts (Figure 1, Item 6).

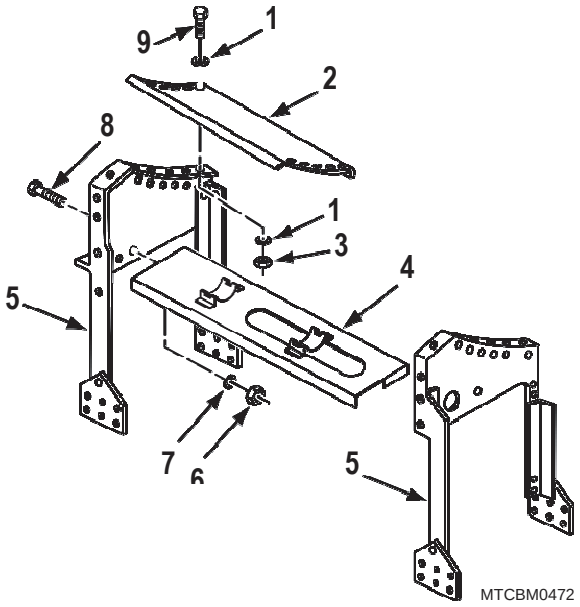


Figure 1. Engine Support Bracket Removal.

3. Remove fuel supply line (Figure 2, Item 4) from fuel pump (Figure 2, Item 1) by removing bolt (Figure 2, Item 3) and washers (Figure 2, Item 2).

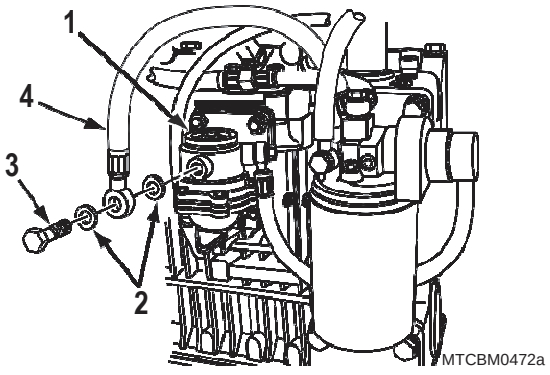


Figure 2. Engine Fuel Supply Line Removal.

4. Remove screw, clamp (Figure 3, Item 15) and fuel return line (Figure 3, Item 17) from engine shroud (Figure 3, Item 16). Reinstall screw (Figure 3, Item 15) on engine shroud (Figure 3, Item 16).

REMOVAL - Continued

5. Loosen clamp (Figure 3, Item 13) and remove fuel return line (Figure 3, Item 17) from fitting (Figure 3, Item 14).
6. Remove nut, lockwasher, and lead (Figure 3, Item 2) from starter motor (Figure 3, Item 1).
7. Remove screw (Figure 3, Item 10), washer, and ground lead (Figure 3, Item 11) from engine mount (Figure 3, Item 8). Reinstall washer (Figure 3, Item 11), and screws (Figure 3, Item 10) on engine mount (Figure 3, Item 8).
8. Remove screw (Figure 3, Item 6) and lead (Figure 3, Item 7) from oil pressure switch (Figure 3, Item 5) and remove engine harness (Figure 3, Item 3) from engine (Figure 3, Item 12).
9. Remove screw and lead (Figure 3, Item 4) from oil pressure switch (Figure 3, Item 5).
10. Remove four self-locking nuts and screws (Figure 3, Item 9) from four engine mounts (Figure 3, Item 8) and cabinet frame. Discard self-locking nuts (Figure 3, Item 9).

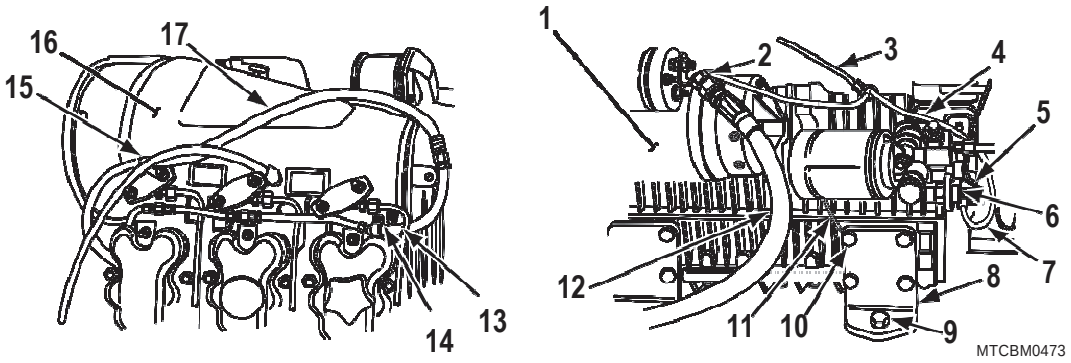


Figure 3. Engine Mount and Harness Removal.

11. Remove eight screws (Figure 4, Item 3), lockwashers (Figure 4, Item 4), and pump clutch ring (Figure 4, Item 5) from engine drive flange (Figure 4, Item 2). Discard lockwashers (Figure 4, Item 4).
12. Remove six screws (Figure 4, Item 6) and lockwashers (Figure 4, Item 7) from pump housing (Figure 4, Item 8) and engine. Discard lockwashers (Figure 4, Item 7).
13. Attach lifting device to engine lifting eyes (Figure 4, Item 1).

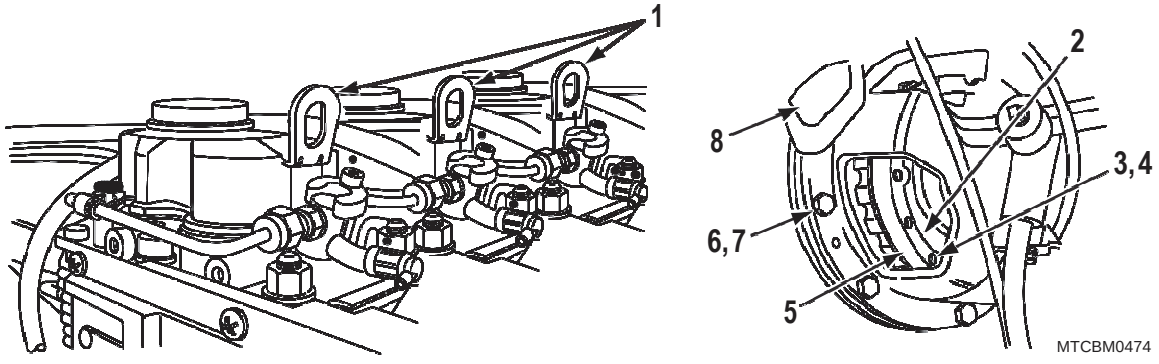
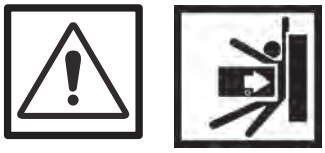


Figure 4. Engine Removal.

REMOVAL - Continued

WARNING



All personnel must stand clear during lifting procedures. A swinging or shifting load may cause injury to personnel or damage to equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

14. Remove engine from cabinet frame.

END OF TASK

PREPARATION FOR INSTALLATION

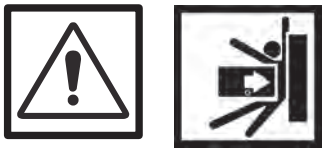
WARNING

- Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible; DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Clean engine, engine mounting cabinet, and attaching components before installation.
2. Remove storage caps from intake, exhaust, and fuel return line ports.
3. Fill engine crankcase with lubrication oil (MIL-L-2104C) to proper fluid level.

INSTALLATION

WARNING



All personnel must stand clear during lifting procedures. A swinging or shifting load may cause injury to personnel or damage to equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Attach lifting device to engine lifting eyes (Figure 5, Item 1).
2. Raise engine and position on cabinet frame.
3. Align engine with pump clutch housing (Figure 5, Item 8) and install with six screws (Figure 5, Item 6) and new lockwashers (Figure 5, Item 7).
4. Install pump clutch ring (Figure 5, Item 5) on the engine drive flange (Figure 5, Item 2) with eight new lockwashers (Figure 5, Item 4) and screws (Figure 5, Item 3).

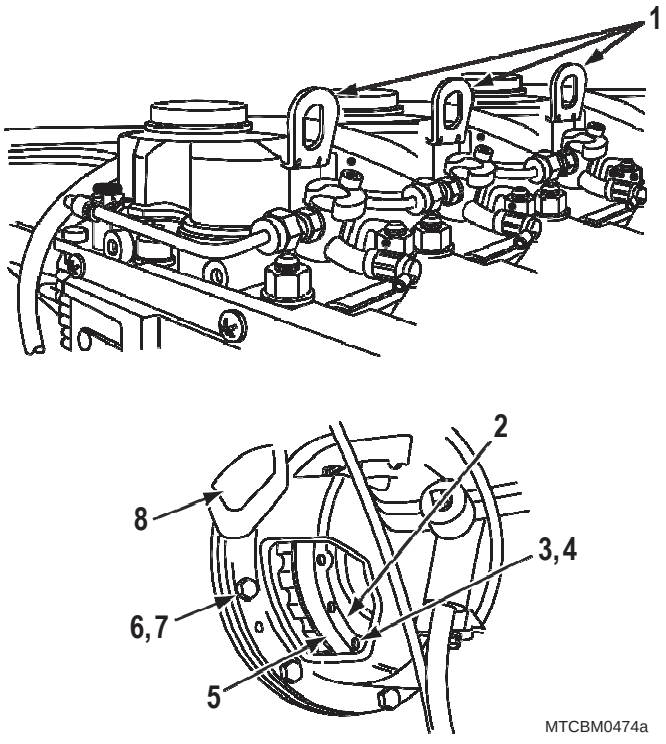


Figure 5. Engine Installation.

INSTALLATION - Continued

5. Install four screws (Figure 6, Item 8) and new self-locking nuts to four engine mounts (Figure 6, Item 7) and cabinet frame.
6. Remove lifting device from engine lifting eyes (Figure 5, Item 1).
7. Install lead (Figure 6, Item 3) on oil pressure switch (Figure 6, Item 4) with screw.
8. Install harness lead (Figure 6, Item 6) on oil pressure switch (Figure 6, Item 4) and screw (Figure 6, Item 5).
9. Remove screw (Figure 6, Item 9) and washer from engine mount (Figure 6, Item 7).
10. Install ground lead (Figure 6, Item 10) on engine mount (Figure 6, Item 7) with washer and screw (Figure 6, Item 9).
11. Install lead (Figure 6, Item 2) on starter motor (Figure 6, Item 1) with lockwasher and nut.
12. Install fuel return line (Figure 6, Item 15) on fitting (Figure 6, Item 12) and tighten clamp (Figure 6, Item 11).
13. Remove screw from engine shroud (Figure 6, Item 14) and install fuel return line (Figure 6, Item 15) with clamp (Figure 6, Item 13) and screw.

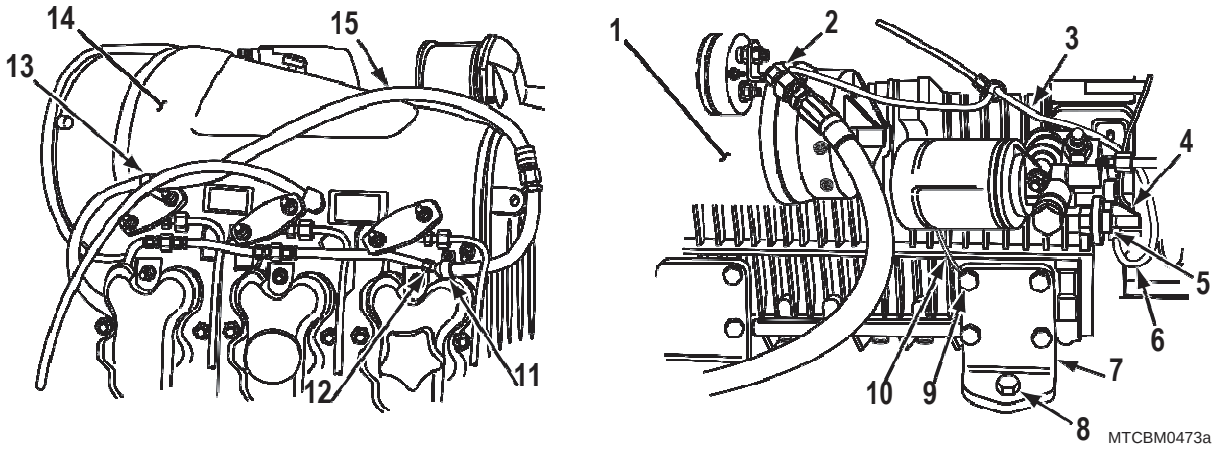


Figure 6. Engine Mount and Harness Installation.

INSTALLATION - Continued

14. Apply sealing compound to threads (Figure 6, Item 5) and install on fuel pump (Figure 7, Item 4).
15. Install fuel supply line (Figure 7, Item 5) on fuel pump (Figure 7, Item 4) with bolt (Figure 7, Item 7) and washers (Figure 7, Item 6).
16. Install muffler tray (Figure 7, Item 11), five screws (Figure 7, Item 13), washers (Figure 7, Item 10), and new self-locking nuts (Figure 7, Item 9) on two support brackets (Figure 7, Item 8).
17. Install firewall (Figure 7, Item 3), 10 screws (Figure 7, Item 1), 20 washers (Figure 7, Item 2), and 10 new self-locking nuts (Figure 7, Item 12) on two support brackets (Figure 7, Item 8).

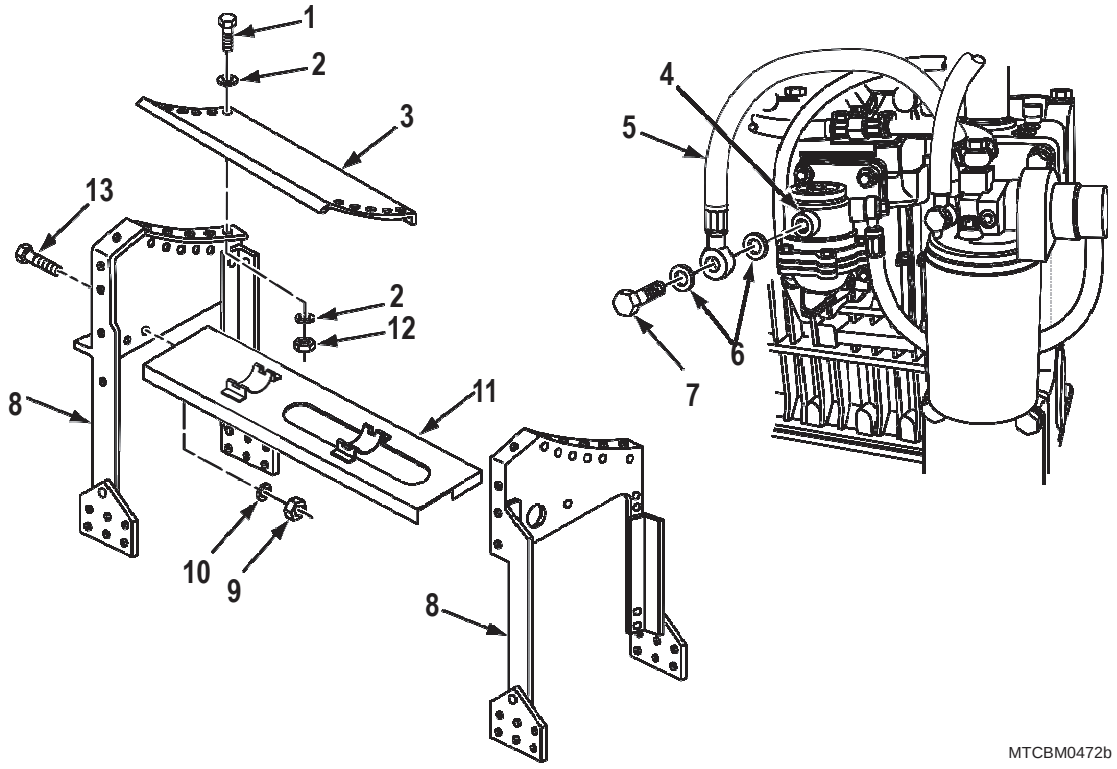


Figure 7. Engine Support Bracket Installation.

END OF TASK

FOLLOW ON TASK

1. Install engine and pump cabinet (WP 0165).
2. Install engine electrical box (WP 0224).
3. Install fuel stop solenoid (WP 0225).
4. Install muffler and exhaust pipe (WP 0213).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE OIL PAN AND DIPSTICK REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)
- Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
- Gasket (WP 0295, Table 1, Item 97)
- Oil, Lubricating (WP 0293, Table 1, Item 18)
- Rag, Wiping

Materials/Parts (cont.)
- (WP 0293, Table 1, Item 20)
- Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)

References
- WP 0286

Equipment Condition
- Engine removed (WP 0176)
- Oil pressure sensor removed (WP 0206)
- Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

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OIL PAN REMOVAL

1. Remove drain plug (Figure 1, Item 2) and washer (Figure 1, Item 3) from oil pan (Figure 1, Item 1), and allow oil to drain.
2. Remove 26 screws (Figure 1, Item 4), flatwashers (Figure 1, Item 5), oil pan (Figure 1, Item 1), and gasket (Figure 1, Item 6) from engine. Discard gasket (Figure 1, Item 6).

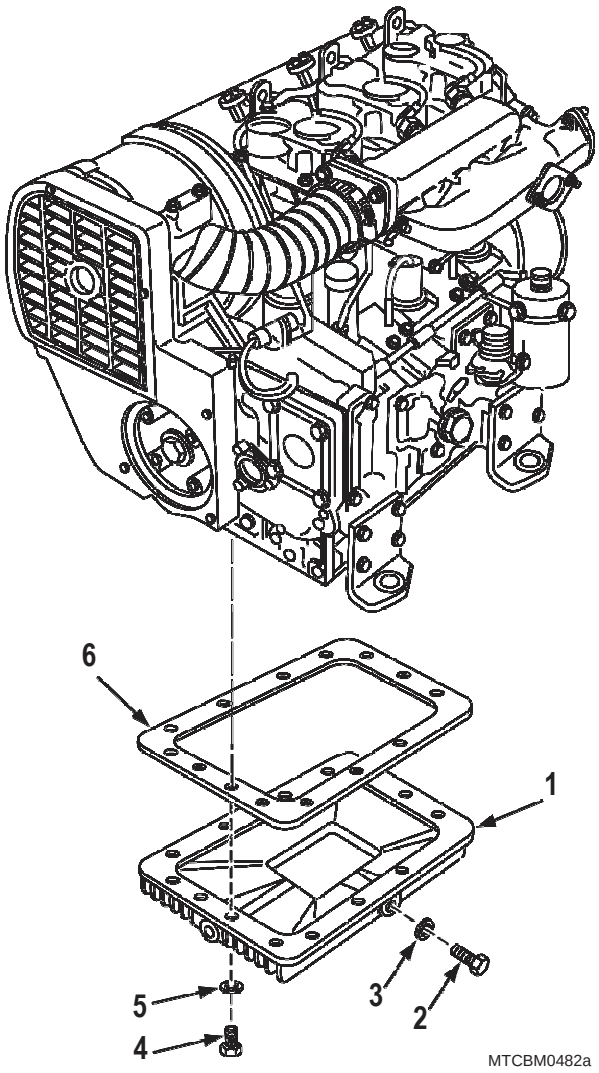

Figure 1. Engine Oil Pan Replacement.

END OF TASK

CLEANING AND INSPECTION

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Clean oil pan (Figure 1, Item 1) with solvent and a clean dry rag.
2. Inspect oil pan (Figure 1, Item 1) and hardware for cracks, breaks, and stripped threads. Replace if damaged.

END OF TASK

OIL PAN INSTALLATION

1. Position new gasket (Figure 2, Item 8) on oil pan (Figure 2, Item 3) and install oil pan on engine with 26 flatwashers (Figure 2, Item 7) and screws (Figure 2, Item 6).
2. Alternately torque screws (Figure 2, Item 6) 18 lb ft (24 N·m).
3. Install washer (Figure 2, Item 5) and drain plug (Figure 2, Item 4) in oil pan (Figure 2, Item 3).
4. Fill engine crankcase to proper fluid level (WP 0286).

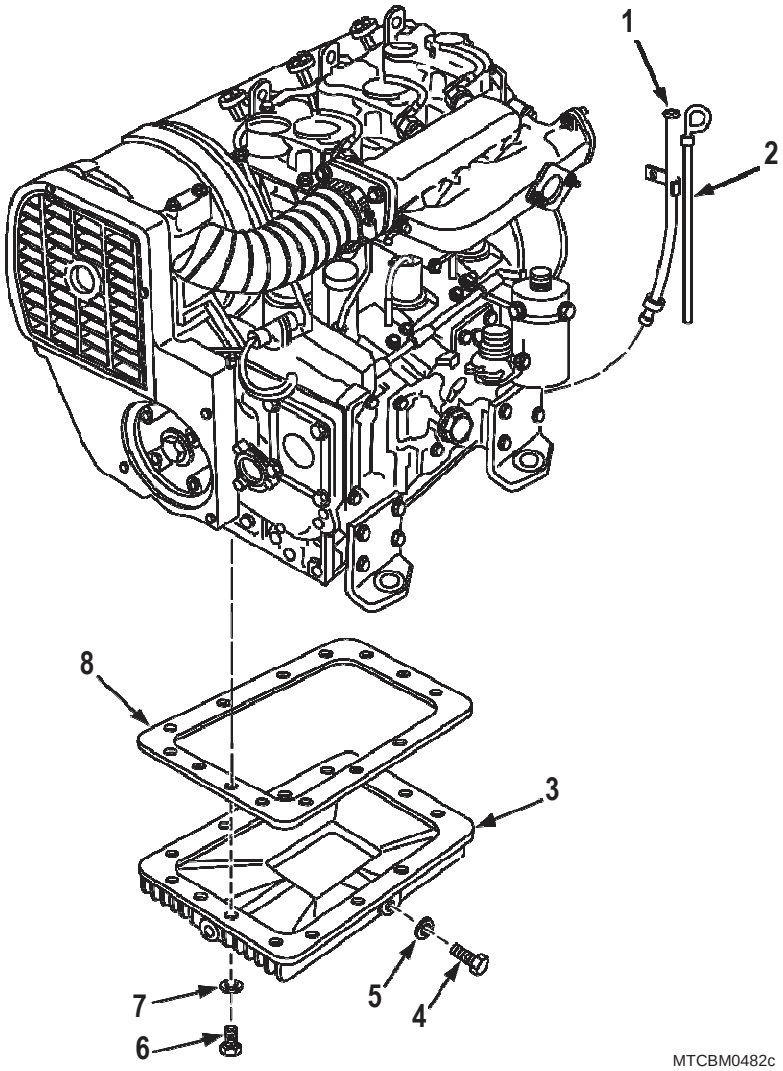

Figure 2. Engine Oil Pan and Dipstick Replacement.

END OF TASK

DIPSTICK REPLACEMENT

NOTE

If dipstick assembly is reinforced with a screw, remove screw.

1. Remove dipstick assembly (Figure 2, Items 1 and 2).

NOTE

If dipstick assembly was reinforced with a screw, install screw.

2. Install dipstick assembly (Figure 2, Items 1 and 2).

END OF TASK

FOLLOW ON TASK

1. Install oil pressure sensor (WP 0206).
2. Install engine (WP 0176).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE OIL FILL ADAPTER REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 80)
Washer, Lock
Qty: (4) (WP 0295, Table 1, Item 110)

References
WP 0286

Equipment Condition
Semitrailer uncoupled (WP 0007)
Engine oil drained (WP 0177)

WARNING

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CAUTION

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REMOVAL

Remove four screws (Figure 1, Item 5), lockwashers (Figure 1, Item 4), engine oil fill adapter (Figure 1, Item 3), and gasket (Figure 1, Item 2) from engine (Figure 1, Item 1). Discard lockwashers (Figure 1, Item 4) and gasket (Figure 1, Item 2).

END OF TASK

INSTALLATION

Install engine oil fill adapter (Figure 1, Item 3) and new gasket (Figure 1, Item 2) on engine (Figure 1, Item 1) with new lockwashers (Figure 1, Item 4) and screws (Figure 1, Item 5).

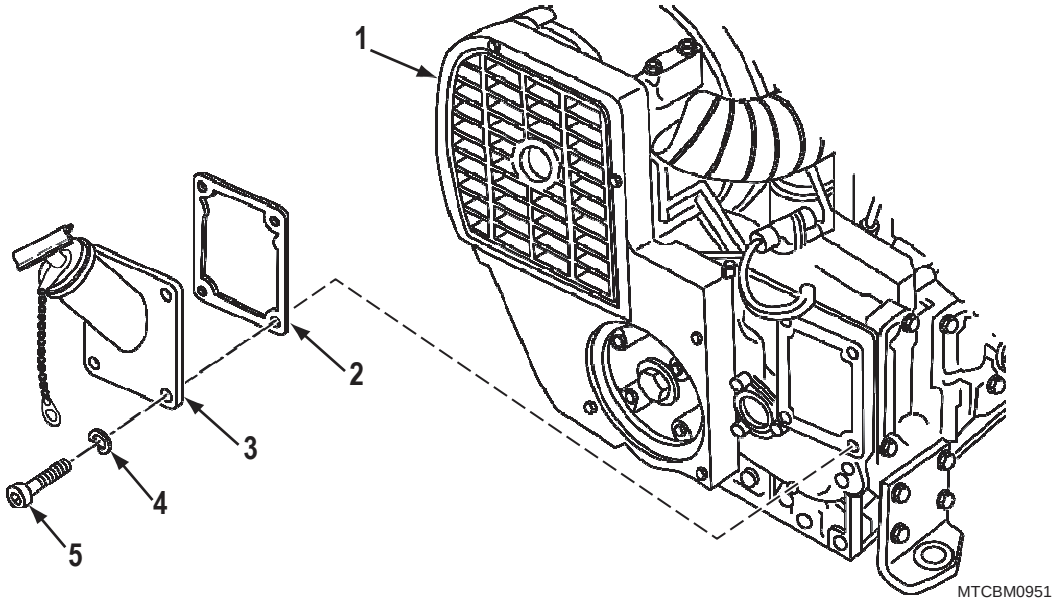

Figure 1. Engine Oil Fill Adapter Replacement.

END OF TASK

FOLLOW ON TASK

Fill engine oil (WP 0286).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE OIL FILTER REPLACEMENT (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Filter, Element, Fluid
(WP 0295, Table 1, Item 48)
Rag, Wiping (WP 0293, Table 1, Item 20)

References
WP 0286

Equipment Condition
Drain engine crankcase (WP 0286)
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

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REMOVAL

1. Remove filter (Figure 1, Item 1) from mounting shaft of engine and drain oil into container. Discard filter (Figure 1, Item 1).
2. Clean filter (Figure 1, Item 1) mounting area on engine.

END OF TASK

INSTALLATION

1. Coat gasket on new filter (Figure 1, Item 1) with clean oil. Install filter (Figure 1, Item 1) on mounting shaft of engine.
2. Hand-tighten filter (Figure 1, Item 1) until gasket touches mounting shaft. Tighten an additional half-turn. DO NOT overtighten.
3. Remove oil fill cap (Figure 1, Item 2) from engine. Inspect gasket in oil fill cap (Figure 1, Item 2) and replace if damaged.
4. Fill engine with oil per (WP 0286). Install oil fill cap (Figure 1, Item 2) on engine and check oil level.

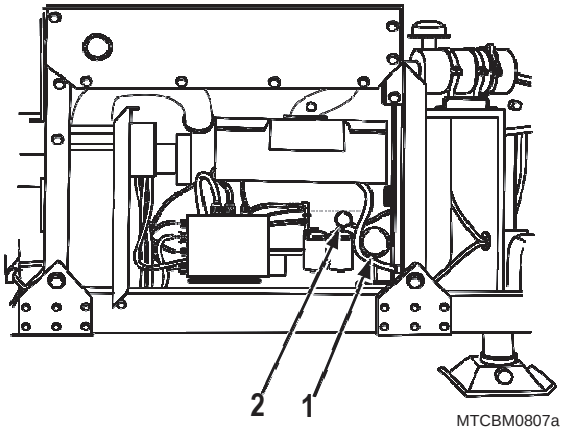

Figure 1. Engine Oil Filter Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE OIL COOLER, LINES, AND FITTINGS REPLACEMENT (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Fuel, Oil, Diesel
(WP 0293, Table 1, Item 9)
Screw, Self-Locking
Qty: (3) (WP 0295, Table 1, Item 114)
Washer, Lock
Qty: (6) (WP 0295, Table 1, Item 120)

References
WP 0286

Equipment Condition
Engine fuel lines removed (WP 0202)

Equipment Condition (cont.)
Muffler shroud removed (WP 0213)
Negative battery cable disconnected (WP 0098)
Remove engine and pump cabinet frame
(WP 0165)
Remove engine door panel (WP 0165)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove self-locking screw (Figure 1, Item 9) and two retaining clips (Figure 1, Item 10) from two oil cooler lines (Figure 1, Items 1 and 2). Discard self-locking screw (Figure 1, Item 9).

NOTE

Oil cooler lines may be filled with oil. Use care to prevent oil from spilling.

2. Remove two oil cooler lines (Figure 1, Items 1 and 2) from oil filter adapter (Figure 1, Item 11). Drain oil from oil cooler lines (Figure 1, Items 1 and 2).
3. Remove two oil cooler lines (Figure 1, Items 1 and 2) from engine oil cooler (Figure 1, Item 3).
4. Remove two self-locking screws (Figure 1, Item 8) and oil cooler mounting plate (Figure 1, Item 6) from engine. Discard self-locking screws (Figure 1, Item 8).

CAUTION

Take care not to bend or damage aluminum cooling fins when removing engine oil cooler. Failure to comply may result in damage to, or destruction of, equipment or mission.

5. Remove six screws (Figure 1, Item 7), lockwashers (Figure 1, Item 5), nuts (Figure 1, Item 4), and engine oil cooler (Figure 1, Item 3) from mounting plate (Figure 1, Item 6). Discard lockwashers (Figure 1, Item 5).

END OF TASK

INSTALLATION

CAUTION

Take care not to bend or damage aluminum cooling fins when removing engine oil cooler. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Install engine oil cooler (Figure 1, Item 3) on mounting plate (Figure 1, Item 6) with six screws (Figure 1, Item 7), new lockwashers (Figure 1, Item 5), and nuts (Figure 1, Item 4).
2. Install two new self-locking screws (Figure 1, Item 8) and mounting plate (Figure 1, Item 6) on engine.
3. Install two oil cooler lines (Figure 1, Items 1 and 2) on engine oil cooler (Figure 1, Item 3).
4. Install two oil cooler lines (Figure 1, Items 1 and 2) on oil filter adapter (Figure 1, Item 11).
5. Install two retaining clips (Figure 1, Item 10) on two oil cooler lines (Figure 1, Items 1 and 2) with new self-locking screw (Figure 1, Item 9).

INSTALLATION - Continued

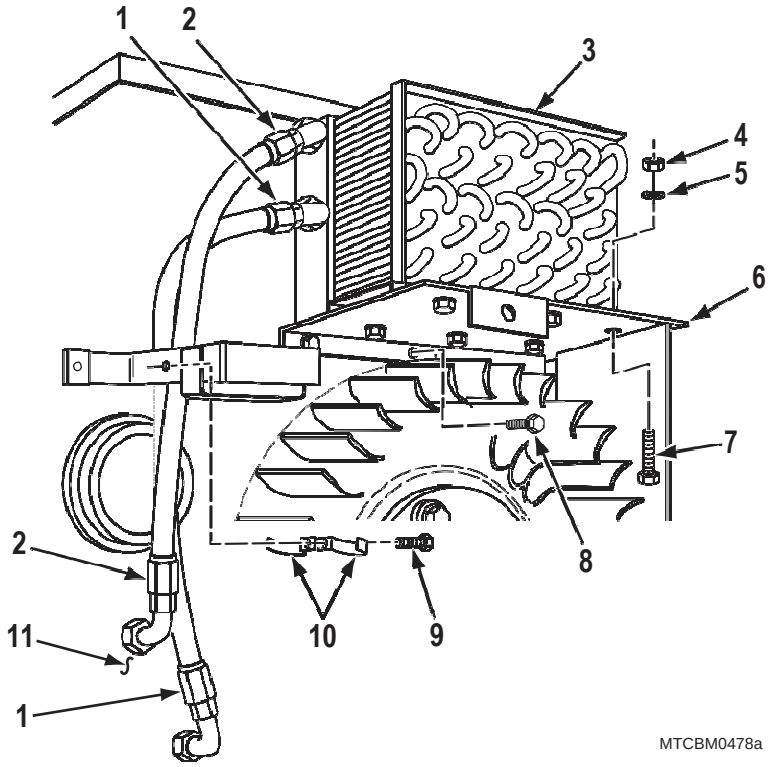

Figure 1. Engine Oil Cooler Replacement.

END OF TASK

FOLLOW ON TASK

1. Install muffler shroud (WP 0213).
2. Install engine fuel lines (WP 0202).
3. Install engine door panel (WP 0165).
4. Install engine and pump cabinet frame (WP 0165).
5. Connect negative battery cable (WP 0098).
6. Fill engine with oil (WP 0286).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE OIL FILTER REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
Filter Element, Fluid (WP 0295, Table 1, Item 143)
Oil, Lubricating

Materials/Parts (cont.)
(WP 0293, Table 1, Item 18)
Rag, Wiping (WP 0293, Table 1, Item 20)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Drain engine crankcase (WP 0286)
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove oil filter (Figure 1, Item 1) from filter head (Figure 1, Item 2). Discard oil filter (Figure 1, Item 1).
2. Wipe oil filter mounting area of filter head (Figure 1, Item 2) with clean dry rag.

END OF TASK

INSTALLATION

1. Coat gasket of new oil filter (Figure 1, Item 1) with clean engine oil.
2. Install oil filter (Figure 1, Item 1) on filter head (Figure 1, Item 2) until gasket touches mounting surface of filter head. Tighten oil filter an additional half turn.

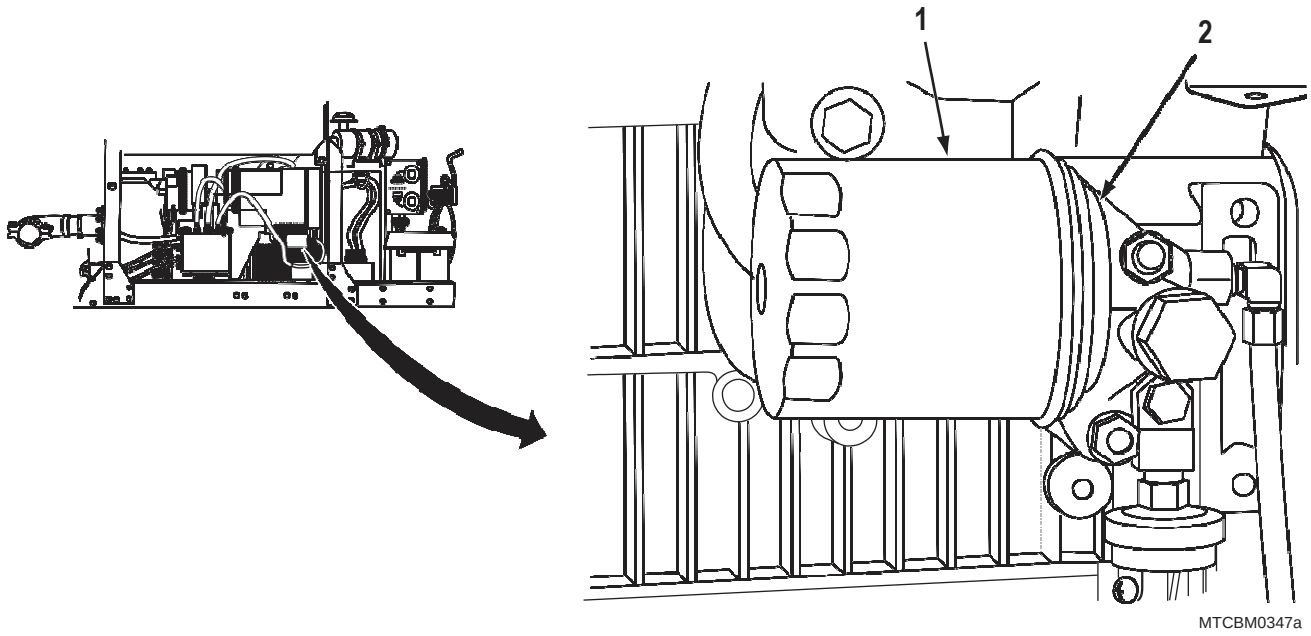

Figure 1. Engine Oil Filter Replacement.

END OF TASK

FOLLOW ON TASK

Fill engine crankcase (WP 0286).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE OIL FILTER HEAD REPAIR (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 82)
Gasket Qty: (2) (WP 0295, Table 1, Item 125)
Gasket Qty: (2) (WP 0295, Table 1, Item 143)
Oil, Lubricating

Materials/Parts (cont.)
(WP 0293, Table 1, Item 18)

Equipment Condition
Oil filter removed (WP 0181)
Oil pressure switch removed (WP 0186)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Tag location and position of oil cooler lines and fittings prior to removal for ease of installation.

DISASSEMBLY

1. Disconnect oil cooler supply line (Figure 1, Item 7) from fitting (Figure 1, Item 1).
2. Remove fitting (Figure 1, Item 2) from oil filter head (Figure 1, Item 4).
3. Disconnect oil return line (Figure 1, Item 6) from fitting (Figure 1, Item 5).

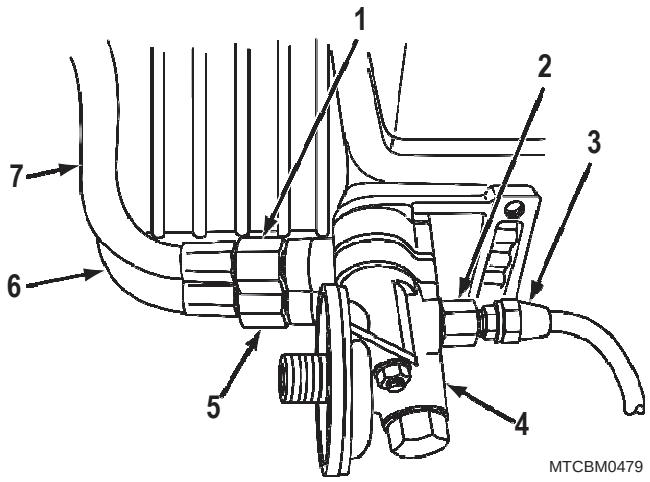

Figure 1. Supply Line Disconnection.

4. Remove two nuts (Figure 2, Item 7), washers (Figure 2, Item 6), oil filter head (Figure 2, Item 5), gasket (Figure 2, Item 3), plate (Figure 2, Item 4), and gasket (Figure 2, Item 3) from engine. Discard gaskets (Figure 2, Item 3).
5. Remove two fittings (Figure 2, Item 2) and gaskets (Figure 2, Item 1) from plate (Figure 2, Item 4). Discard gaskets (Figure 2, Item 1).

END OF TASK

ASSEMBLY

1. Apply sealing compound to male threads of fitting prior to installation.
2. Install two new gaskets (Figure 2, Item 1) and fittings (Figure 2, Item 2) on oil filter head (Figure 2, Item 4).
3. Install two new gaskets (Figure 2, Item 3), plate (Figure 2, Item 4), and oil filter head (Figure 2, Item 5) on engine with two washers (Figure 2, Item 6) and nuts (Figure 2, Item 7).

ASSEMBLY - Continued

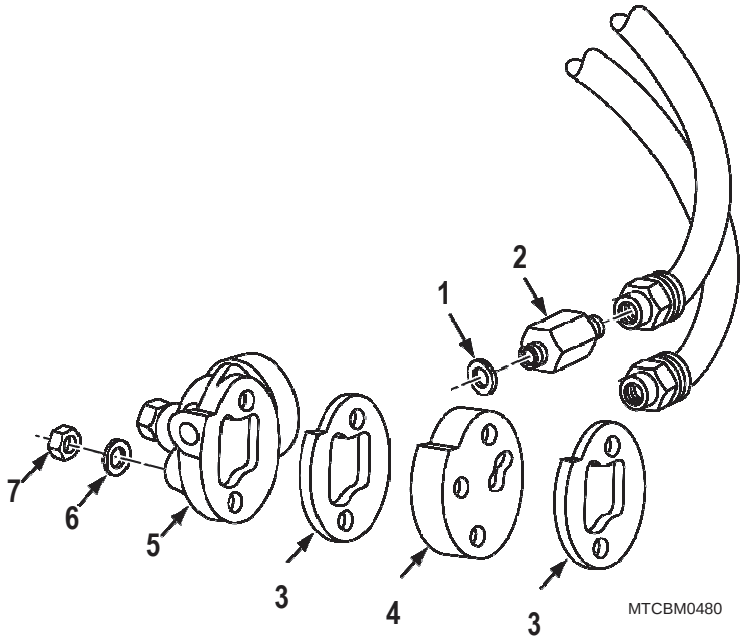

Figure 2. Engine Oil Filter Head Disassembly.

4. Connect oil pressure line (Figure 1, Item 3) to fitting (Figure 1, Item 2).
5. Connect oil cooler return line (Figure 1, Item 6) to fitting (Figure 1, Item 5).
6. Connect oil cooler supply line (Figure 1, Item 7) to fitting (Figure 1, Item 1).

END OF TASK

FOLLOW ON TASK

1. Install oil filter (WP 0181).
2. Install oil pressure switch (WP 0186).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE OIL COOLER, LINES, AND FITTINGS REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Strap, Tiedown (WP 0293, Table 1, Item 27)
Gasket Qty: (2) (WP 0295, Table 1, Item 125)

References
WP 0286

Equipment Condition
Engine oil filter removed (WP 0181)
Oil pressure switch removed (WP 0186)
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Tag location and position of oil cooler lines and fittings prior to removal for ease of installation.

REMOVAL

1. Remove tiedown strap (Figure 1, Item 4) from oil supply line (Figure 1, Item 2) and return lines (Figure 1, Item 3). Discard tiedown strap (Figure 1, Item 4).
2. Disconnect oil supply line (Figure 1, Item 2) and return lines (Figure 1, Item 3) from fittings (Figure 1, Item 5).
3. Remove two nuts (Figure 1, Item 9), screws (Figure 1, Item 10), and oil cooler (Figure 1, Item 7) from bracket (Figure 1, Item 8).
4. Remove bracket (Figure 1, Item 8) from oil cooler (Figure 1, Item 7).
5. Disconnect oil supply line (Figure 1, Item 2) and gasket and return line (Figure 1, Item 3) and gasket from oil cooler (Figure 1, Item 7). Discard gaskets.
6. Remove three screws (Figure 1, Item 6) and bracket (Figure 1, Item 8) from engine (Figure 1, Item 1).

END OF TASK

INSTALLATION

1. Install bracket (Figure 1, Item 8) on engine (Figure 1, Item 1) with three screws (Figure 1, Item 6).
2. Connect oil supply line (Figure 1, Item 2) and new gasket and return line (Figure 1, Item 3) and new gasket to oil cooler (Figure 1, Item 7).
3. Install bracket (Figure 1, Item 8) on oil cooler (Figure 1, Item 7) with two screws (Figure 1, Item 10) and nuts (Figure 1, Item 9).
4. Connect oil supply line (Figure 1, Item 2) and return line (Figure 1, Item 3) to fittings (Figure 1, Item 5).
5. Install new tiedown strap (Figure 1, Item 4) around oil supply line (Figure 1, Item 2) and return line (Figure 1, Item 3).

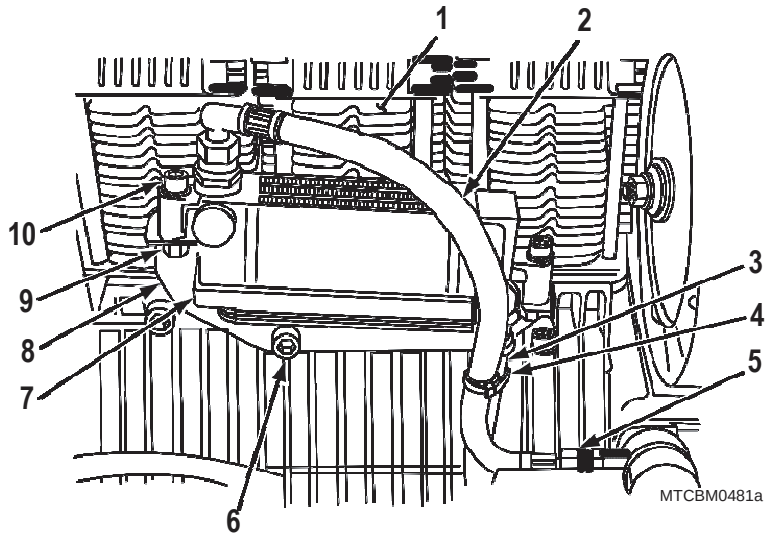

Figure 1. Engine Oil Cooler Lines Installation.

END OF TASK

FOLLOW ON TASK

1. Install oil pressure switch (WP 0186).
2. Install oil filter (WP 0181).
3. Fill oil to proper level (WP 0286).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE OIL PUMP REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)
- Puller Kit, Mechanical (WP 0294, Table 1, Item 16)
- Wrench, Torque (WP 0294, Table 1, Item 25)
- Wrench, Torque (WP 0294, Table 1, Item 27)

Materials/Parts
- Gasket (WP 0295, Table 1, Item 82)

Materials/Parts (cont.)
- Key, Woodruff (WP 0295, Table 1, Item 199)
- Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)
- Washer, Lock Qty: (2) (WP 0295, Table 1, Item 110)
- Washer, Lock (WP 0295, Table 1, Item 111)

Equipment Condition
- Engine removed (WP 0176)
- Semitrailer uncoupled (WP 0007)
- Alternator removed (WP 0217)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

NOTE

Crankshaft pulley screw has left-handed threads.

1. Remove screw (Figure 1, Item 5) and washer (Figure 1, Item 4) from crankshaft pulley (Figure 1, Item 3).
2. Remove crankshaft pulley (Figure 1, Item 3) and woodruff key (Figure 1, Item 1) from crankshaft (Figure 1, Item 2). Discard woodruff key (Figure 1, Item 1).

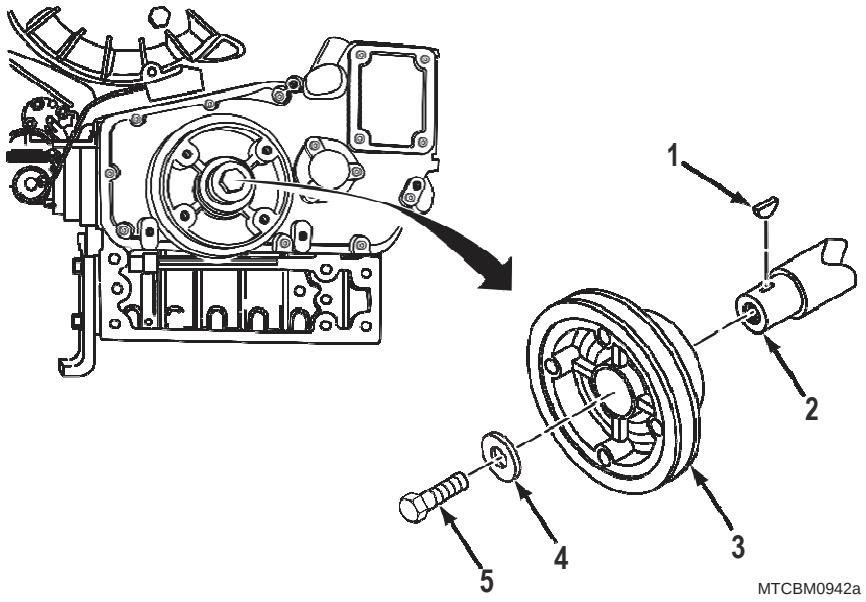

Figure 1. Crankshaft Pulley Removal.

NOTE

Timing gear cover screws are different lengths. Note location and position of screws for installation.

3. Removing 12 screws (Figure 2, Item 3), timing gear cover (Figure 2, Item 1), and gasket (Figure 2, Item 2) from engine. Discard gasket (Figure 2, Item 2).

REMOVAL - Continued

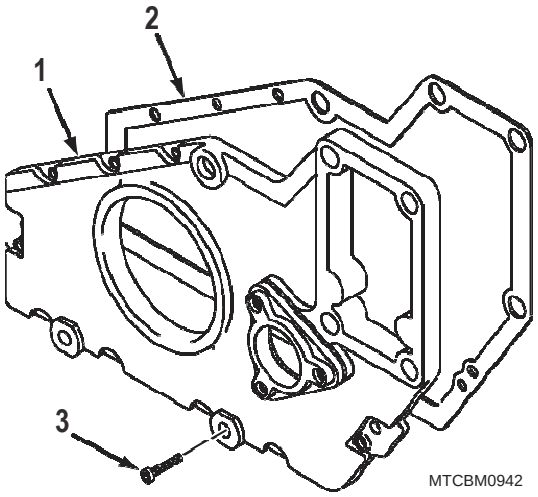

Figure 2. Timing Gear Cover Removal.

4. Remove nut (Figure 3, Item 4) and lockwasher (Figure 3, Item 5) from oil pump gear (Figure 3, Item 6). Discard lockwasher (Figure 3, Item 5).
5. Using puller, remove oil pump gear (Figure 3, Item 6) from oil pump (Figure 3, Item 1).
6. Remove two screws (Figure 3, Item 3), lockwashers (Figure 3, Item 2), and oil pump (Figure 3, Item 1) from engine. Discard lockwashers (Figure 3, Item 2).

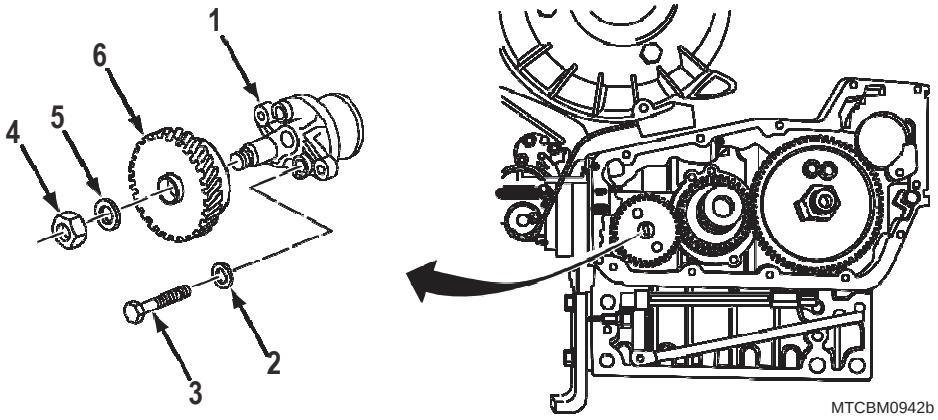

Figure 3. Oil Pump Gear Removal.

END OF TASK

CLEANING AND INSPECTION

WARNING

- Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible; DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Clean oil pump (Figure 4, Item 1) housing with solvent, allow to air dry.
2. Inspect gear teeth are free from chips, breaks, and wear. Replace oil pump (Figure 4, Item 1) if damaged.
3. Check that shaft rotates freely without obstruction. Replace oil pump (Figure 4, Item 1) if damaged.

END OF TASK

INSTALLATION

1. Coat oil pump drive gear (Figure 4, Item 3) and housing drive gear (Figure 4, Item 2) with clean lubrication oil.
2. Install oil pump (Figure 4, Item 1) on engine with two new lockwashers (Figure 4, Item 4), and screws (Figure 4, Item 5). Torque screws 216 lb in. (24 N·m).
3. Install oil pump gear (Figure 4, Item 8) on oil pump (Figure 4, Item 1) with new lockwasher (Figure 4, Item 7) and nut (Figure 4, Item 6). Torque nut to 25 lb ft (33 N·m).

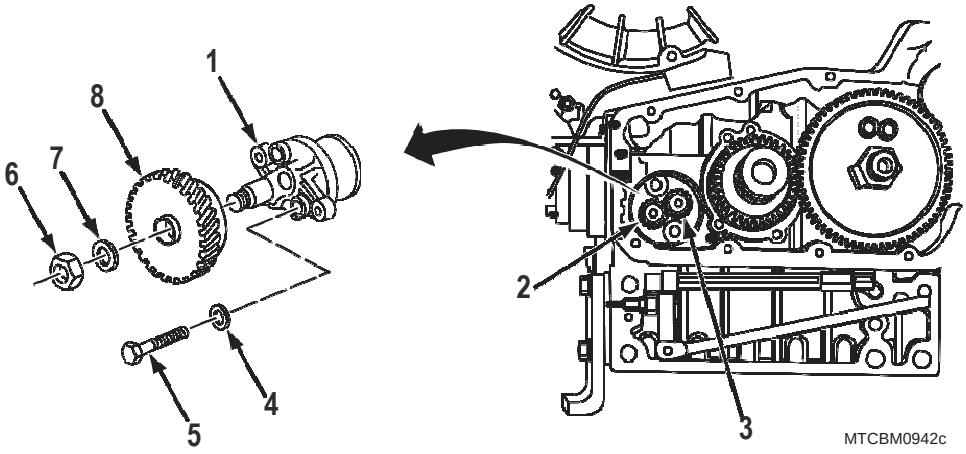

Figure 4. Oil Pump Gear Installation.

4. Install new gasket (Figure 5, Item 2) and timing gear cover (Figure 5, Item 1) on engine with 12 screws (Figure 5, Item 3).

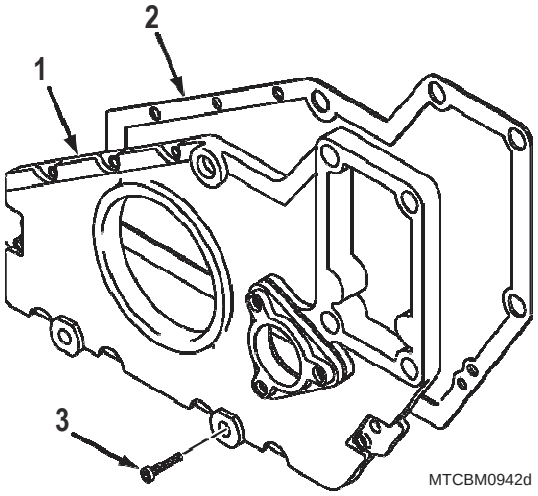

Figure 5. Timing Gear Cover Installation.

INSTALLATION - Continued

5. Position new woodruff key (Figure 6, Item 1) and crankshaft pulley (Figure 6, Item 3) on crankshaft (Figure 6, Item 2) and install with washer (Figure 6, Item 4) and screw (Figure 6, Item 5).

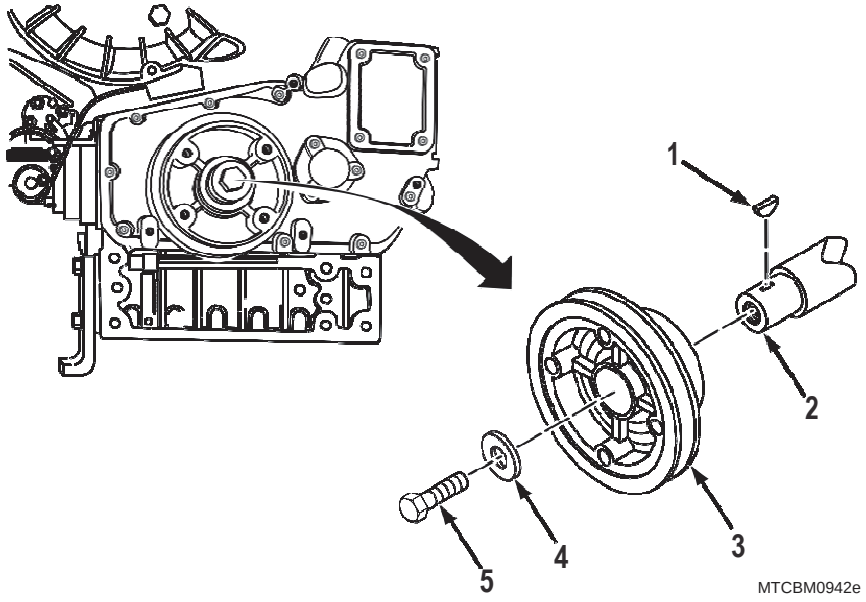

Figure 6. Crankshaft Pulley Installation.

END OF TASK

FOLLOW ON TASK

Install engine (WP 0176).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE OIL SUMP TUBE REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 27)

Materials/Parts
Gasket (WP 0295, Table 1, Item 96)
Washer, Lock

Materials/Parts (cont.)
(WP 0295, Table 1, Item 110)
Washer, Lock
Qty: (2) (WP 0295, Table 1, Item 109)

Equipment Condition
Oil pan removed (WP 0177)

REMOVAL

Remove three screws (Figure 1, Item 4), lockwashers (Figure 1, Item 3), oil sump tube (Figure 1, Item 2), and gasket (Figure 1, Item 1) from engine (Figure 1, Item 5). Discard lockwashers (Figure 1, Item 3) and gasket (Figure 1, Item 1).

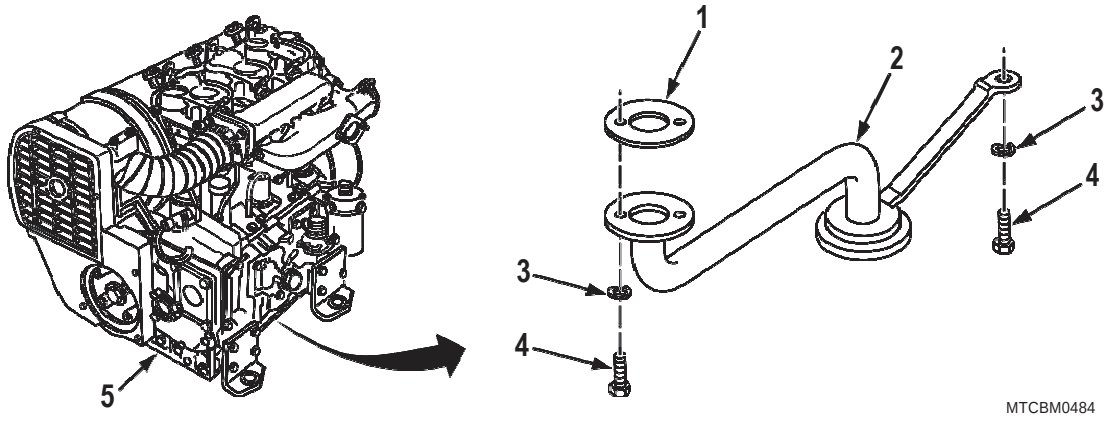

Figure 1. Engine Oil Sump Tube Removal.

END OF TASK

INSTALLATION

Install new gasket (Figure 2, Item 1) and oil sump tube (Figure 2, Item 2) on engine (Figure 2, Item 5) with three new lockwashers (Figure 2, Item 3) and screws (Figure 2, Item 4). Torque screws to 216 lb in. (24 N·m).

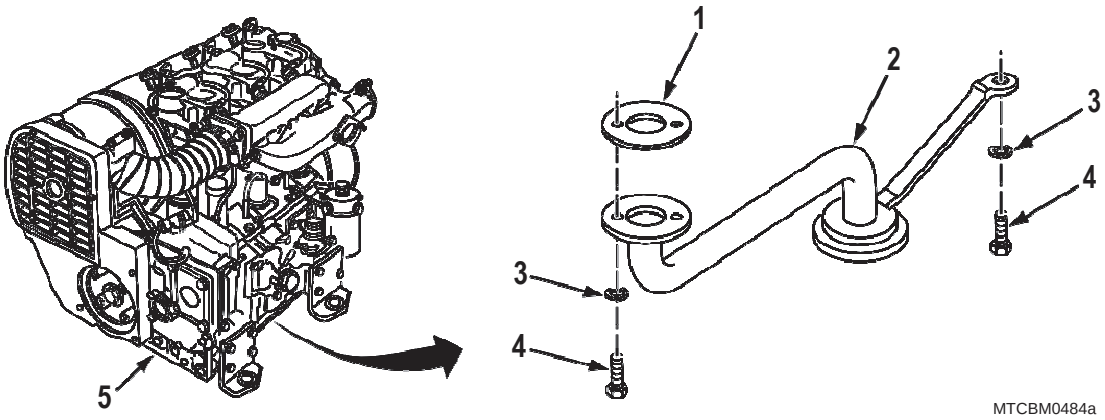

Figure 2. Engine Oil Sump Tube Installation.

END OF TASK

FOLLOW ON TASK

Install oil pan (WP 0177).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
OIL PRESSURE SWITCH REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Negative battery cables connected (WP 0098)

WARNING

- Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Remove or disconnect batteries prior to performing maintenance in immediate battery area or working on electrical system. Such disconnections prevent electrical shock to personnel or equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove two screws (Figure 1, Item 7) and electrical connections (Figure 1, Item 6) attached to the oil pressure switch (Figure 1, Item 5).
2. Remove bolt (Figure 1, Item 1), washer (Figure 1, Item 2), oil pressure switch adapter (Figure 1, Item 3), and washer (Figure 1, Item 4) from engine (Figure 1, Item 8).
3. Remove oil pressure switch (Figure 1, Item 5) from adapter (Figure 1, Item 3).

END OF TASK

INSTALLATION

1. Install oil pressure switch (Figure 1, Item 5) to adapter (Figure 1, Item 3).
2. Install washer (Figure 1, Item 4), oil switch adapter (Figure 1, Item 3), washer (Figure 1, Item 2), and bolt (Figure 1, Item 1) to engine (Figure 1, Item 8)
3. Connect electrical lines (Figure 1, Item 6) to oil pressure switch (Figure 1, Item 5) with two screws (Figure 1, Item 7).

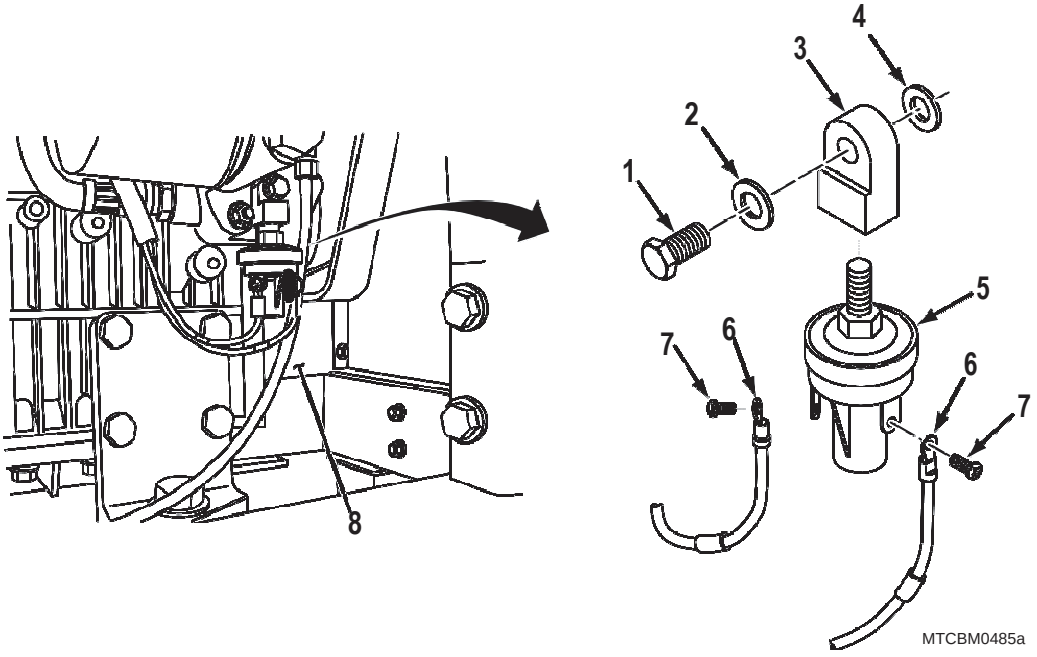

Figure 1. Oil Pressure Switch Replacement.

END OF TASK

FOLLOW ON TASK

Reconnect negative battery cables (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
GLOW PLUGS MAINTENANCE (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Negative battery cables disconnected (WP 0098)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

REMOVAL

1. Remove nut (Figure 1, Item 3) and lead (Figure 1, Item 4) from glow plug (Figure 1, Item 2).
2. Remove glow plug (Figure 1, Item 2) from air intake manifold (Figure 1, Item 1).

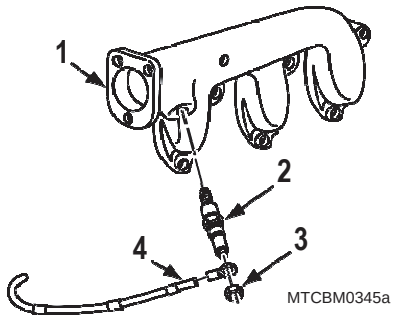

Figure 1. Glow Plug Maintenance.

END OF TASK

INSPECTION

WARNING

With preheater switch in PREHEAT position, 12 V dc are applied to glow plugs. Do not handle glow plugs with preheater switch in PREHEAT position. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Check to see if electrical leads (Figure 1, Item 4) to glow plugs (Figure 1, Item 2) are clean and secure.

END OF TASK

INSTALLATION

1. Install glow plug (Figure 1, Item 2) on air intake manifold (Figure 1, Item 1).
2. Install lead (Figure 1, Item 4) on glow plug (Figure 1, Item 2) with nut (Figure 1, Item 3).

END OF TASK

FOLLOW ON TASK

Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AIR INTAKE MANIFOLD REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
Gasket Qty: (3) (WP 0295, Table 1, Item 91)
Gasket (WP 0295, Table 1, Item 95)
Washer, Lock

Materials/Parts (cont.)
Qty: (9) (WP 0295, Table 1, Item 110)

Equipment Condition
Glow plugs removed (WP 0187)
Muffler and exhaust pipe removed (WP 0213)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Disconnect air cleaner restrictor tube (Figure 1, Item 2) from intake manifold (Figure 1, Item 4).
2. Loosen two clamps (Figure 1, Item 1) and remove air cleaner hose (Figure 1, Item 13) from air cleaner elbow (Figure 1, Item 8).
3. Remove six nuts (Figure 1, Item 5), lockwashers (Figure 1, Item 6), air intake manifold (Figure 1, Item 4), and three gaskets (Figure 1, Item 3) from engine. Discard gaskets (Figure 1, Item 3) and lockwashers (Figure 1, Item 6).
4. Remove two screws (Figure 1, Item 12), lockwashers (Figure 1, Item 11), nut (Figure 1, Item 10), lockwasher (Figure 1, Item 9), elbow (Figure 1, Item 8), and gasket (Figure 1, Item 7) from air intake manifold (Figure 1, Item 4). Discard gasket (Figure 1, Item 7) and lockwashers (Figure 1, Item 11).

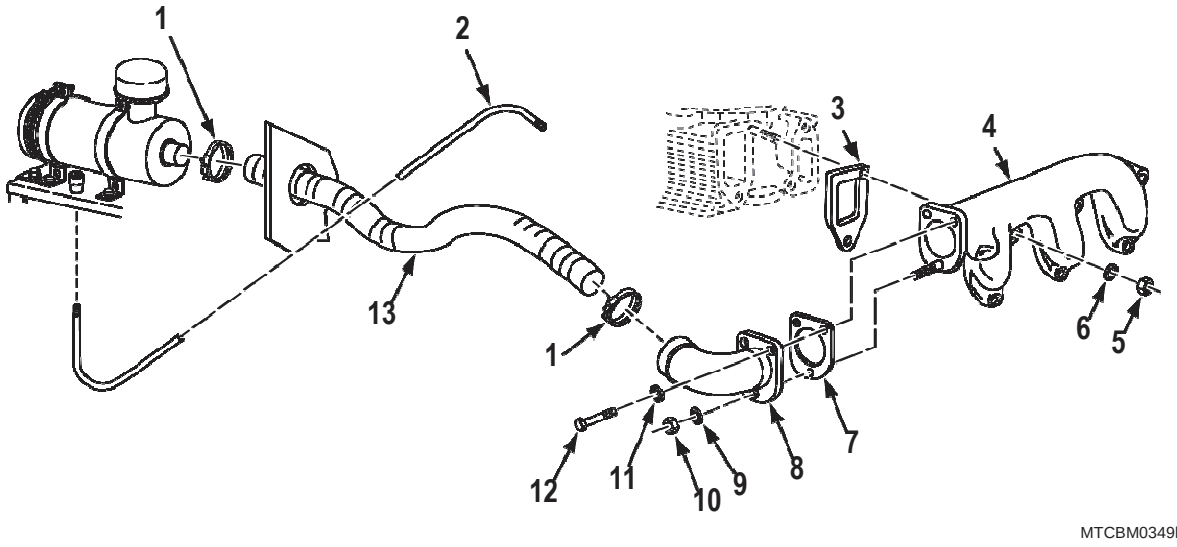

Figure 1. Air Intake Manifold Removal.

END OF TASK

INSTALLATION

1. Install new gasket (Figure 2, Item 7) and elbow (Figure 2, Item 8) on air intake manifold (Figure 2, Item 4) with new lockwasher (Figure 2, Item 9), nut (Figure 2, Item 10), two new lockwashers (Figure 2, Item 11), and screws (Figure 2, Item 12). Torque screws and nut 18 lb ft (24 N·m).
2. Install three new gaskets (Figure 2, Item 3) and air intake manifold (Figure 2, Item 4) on engine with six new lockwashers (Figure 2, Item 6) and nuts (Figure 2, Item 5). Torque nuts to 18 lb ft (24 N·m).
3. Install air cleaner hose (Figure 2, Item 13) on elbow (Figure 2, Item 8) and tighten two clamps (Figure 2, Item 1).
4. Connect air cleaner restrictor tube (Figure 2, Item 2) on intake manifold (Figure 2, Item 4).

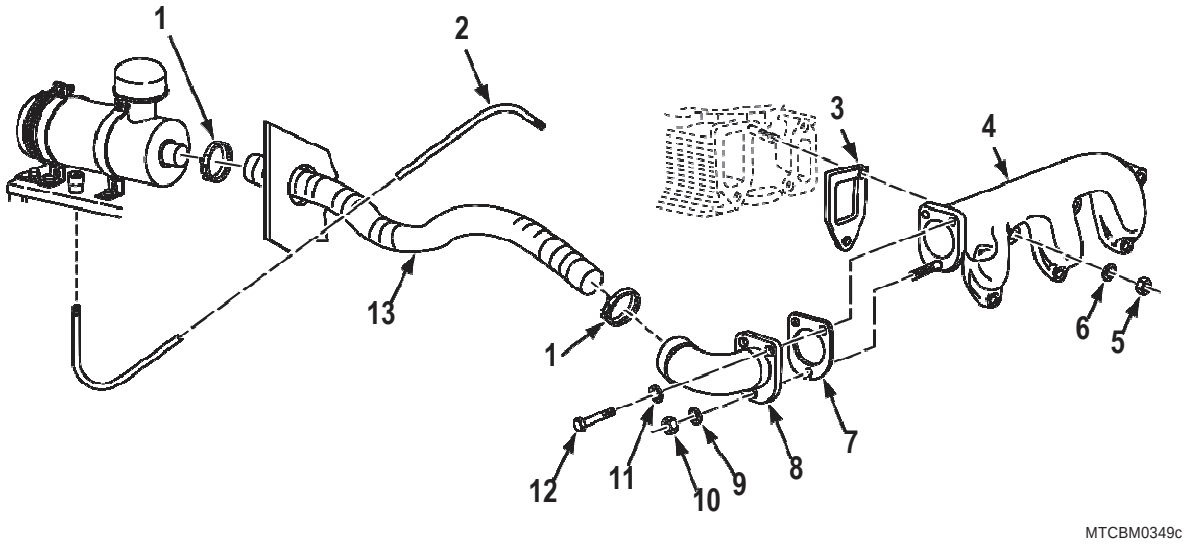

Figure 2. Air Intake Manifold Installation.

END OF TASK

FOLLOW ON TASK

1. Install muffler and exhaust pipe (WP 0213).
2. Install glow plugs (WP 0187).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL INJECTION LINES AND FITTINGS REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0008

Equipment Condition
Engine removed (WP 0176)

Equipment Condition (cont.)
Curbside hose trough cover removed (WP 0145)
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

FUEL INJECTION RETURN LINE REMOVAL

1. Remove screw (Figure 1, Item 5), washer, fuel injection return line (Figure 1, Item 1), and washer from fuel filter housing (Figure 1, Item 6).
2. Remove three screws (Figure 1, Item 2), washers, fuel injection return line (Figure 1, Item 1), and three washers from fuel metering pumps (Figure 1, Item 7).
3. Remove three screws (Figure 1, Item 3), washers (Figure 1, Item 4), fuel injection return line (Figure 1, Item 1), and washers from fuel injectors (Figure 1, Item 2).
4. Loosen clamp (Figure 1, Item 9) and remove fuel return line (Figure 1, Item 8) from fitting (Figure 1, Item 10).

END OF TASK

FUEL INJECTION LINE REMOVAL

NOTE

There are three fuel injection lines. All fuel injection lines are removed the same way.

1. Remove screw, clamp (Figure 1, Item 9) and fuel injection line (Figure 1, Item 8) from engine.
2. Loosen two nuts and remove fuel injection line (Figure 1, Item 8) from fuel metering pump (Figure 1, Item 7) and fuel injector (Figure 1, Item 2).

END OF TASK

FUEL INJECTION LINE INSTALLATION

NOTE

There are three fuel injection lines. All fuel injection lines are installed the same way.

Install fuel injector line (Figure 1, Item 8) on fuel metering pump (Figure 1, Item 7) and fuel injector (Figure 1, Item 2) and tighten two nuts (Figure 1, Item 5).

END OF TASK

FUEL INJECTION RETURN LINE INSTALLATION

1. Install three washers and fuel injection return line (Figure 1, Item 1) on fuel injectors (Figure 1, Item 2) with screws (Figure 1, Item 3).
2. Install three washers and fuel injection return line (Figure 1, Item 1) on fuel metering pumps (Figure 1, Item 7) with screws.
3. Install washer and fuel injection return line (Figure 1, Item 1) on fuel filter housing (Figure 1, Item 6) with washer and screw.

FUEL INJECTION RETURN LINE INSTALLATION - Continued

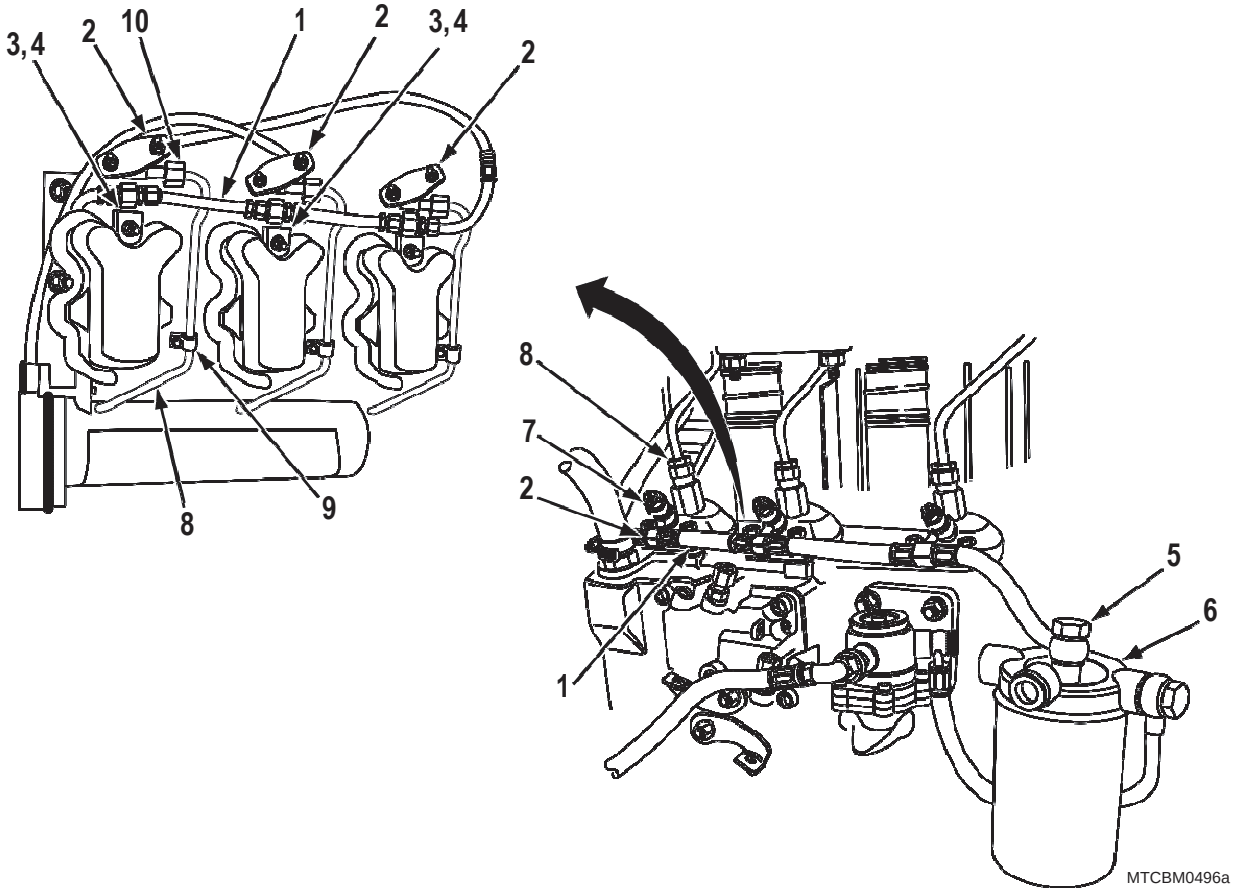

Figure 1. Fuel Injection Return Line Replacement.

END OF TASK

FOLLOW ON TASK

1. Install curbside hose trough cover (WP 0145).
2. Install engine (WP 0176).
3. Prime fuel system (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL METERING PUMP REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 25)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Engine removed (WP 0176)

Materials/Parts
Gasket (WP 0295, Table 1, Item 64)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Lombardini engines have four fuel metering pump assemblies. The lines between the pumps are different but connected the same. All other components are replaced the same way.

REMOVAL

1. Remove screw (Figure 1, Item 4), washer (Figure 1, Item 3), fuel injection return line (Figure 1, Item 2), and washer (Figure 1, Item 1) from fuel metering pump (Figure 1, Item 8).
2. Loosen nut (Figure 1, Item 9) and remove fuel injection line (Figure 1, Item 10) from fuel metering pump (Figure 1, Item 8).
3. Remove three screws (Figure 1, Item 5), washers (Figure 1, Item 6), fuel metering pump (Figure 1, Item 8), and gasket (Figure 1, Item 7) from engine. Discard gasket (Figure 1, Item 7).

END OF TASK

INSTALLATION

NOTE

When replacing fuel metering pump, ensure new pump has a reference mark of the same color and location that coincides with other pumps. When installed, remove rack rod lock from pump and ensure rack rod moves freely.

1. Install new gasket (Figure 1, Item 7) and fuel metering pump (Figure 1, Item 8) on engine with three washers (Figure 1, Item 6) and screws (Figure 1, Item 5). Torque screws 18 lb ft (24 N·m).
2. Install fuel injection line (Figure 1, Item 10) on fuel metering pump (Figure 1, Item 8) and tighten nut (Figure 1, Item 9).
3. Install washer (Figure 1, Item 1), fuel injection return line (Figure 1, Item 2), washer (Figure 1, Item 3), and screw (Figure 1, Item 4) on fuel metering pump (Figure 1, Item 8).

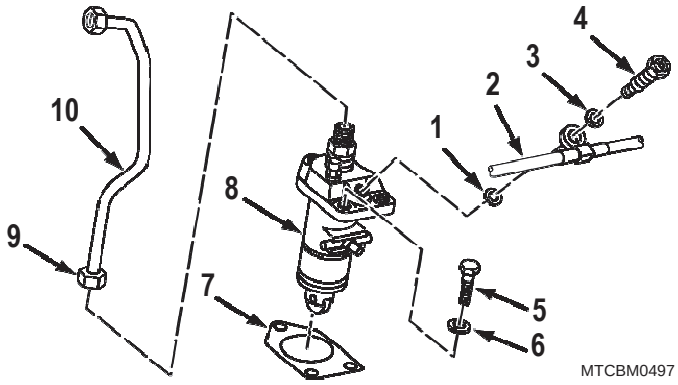

Figure 1. Fuel Metering Pump Replacement.

END OF TASK

FOLLOW ON TASK

Install engine (WP 0176).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL INJECTION NOZZLE REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 25)

Equipment Condition
Engine removed (WP 0176)

Materials/Parts
Gasket (WP 0295, Table 1, Item 83)
Washer, Lock
Qty: (2) (WP 0295, Table 1, Item 109)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL (PRE-EPA)

1. Loosen nut (Figure 1, Item 1) and disconnect fuel injection line (Figure 1, Item 6) from fitting (Figure 1, Item 2) on fuel injector (Figure 1, Item 8).
2. Remove screw (Figure 1, Item 5), two washers (Figure 1, Item 4), and fuel injection return line (Figure 1, Item 3) from fuel injector (Figure 1, Item 8).
3. Remove two nuts (Figure 1, Item 1), lockwashers (Figure 1, Item 10), and fitting (Figure 1, Item 2) from fuel injector (Figure 1, Item 8). Discard lockwashers (Figure 1, Item 10).

CAUTION

Use extreme care when removing fuel injector. Sealing gaskets/shims may become loose causing faulty injector and engine performance. Failure to comply may result in damage to, or destruction of, equipment or mission.

4. Remove fuel injector (Figure 1, Item 8) from engine (Figure 1, Item 9).
5. Remove gasket (Figure 1, Item 7) from fuel injector (Figure 1, Item 8). Discard gasket (Figure 1, Item 7).

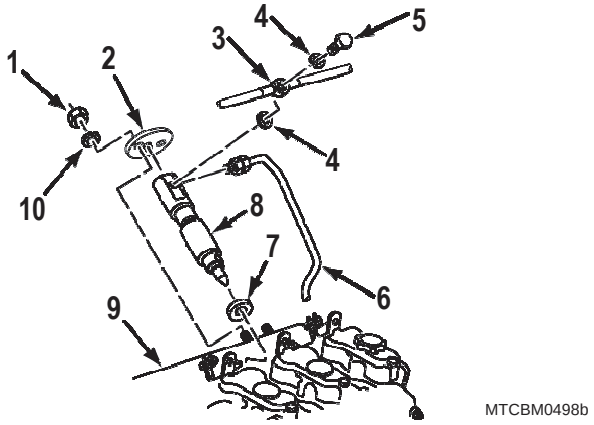

Figure 1. Fuel Injection Nozzle Replacement (Pre-EPA).

END OF TASK

INSTALLATION (PRE-EPA)

1. Install new gasket (Figure 1, Item 7) on fuel injector (Figure 1, Item 8).
2. Install fuel injector (Figure 1, Item 8) on engine (Figure 1, Item 9). Ensure inlet and outlet port are positioned correctly.
3. Position fitting (Figure 1, Item 2) on fuel injector (Figure 1, Item 8) and install with two new lockwashers (Figure 1, Item 10) and nuts (Figure 1, Item 1). Torque nuts to 7 lb ft (9 N·m).
4. Install two washers (Figure 1, Item 4), fuel injection return line (Figure 1, Item 3), and screw (Figure 1, Item 5) on fuel injector (Figure 1, Item 8).
5. Install fuel injection line (Figure 1, Item 6) on fuel injector (Figure 1, Item 8) and torque nut (Figure 1, Item 1).

END OF TASK

REMOVAL (EPA AND TIER II)

1. Loosen nut and disconnect fuel injection line (Figure 2, Item 5) from bracket (Figure 2, Item 4) on fuel injector (Figure 2, Item 8).
2. Remove clamp (Figure 2, Item 9) and fuel injection return line (Figure 2, Item 1) from fuel injector (Figure 2, Item 8).
3. Remove screw (Figure 2, Item 3), lockpin (Figure 2, Item 2), and bracket (Figure 2, Item 4) from fuel injector (Figure 2, Item 8).

CAUTION

Use extreme care when removing fuel injector. Sealing gaskets/shims may become loose causing faulty injector and engine performance. Failure to comply may result in damage to, or destruction of, equipment or mission.

4. Remove fuel injector (Figure 2, Item 8) from engine (Figure 1, Item 7).
5. Remove gasket (Figure 2, Item 6) from fuel injector (Figure 2, Item 8). Discard gasket (Figure 2, Item 6).

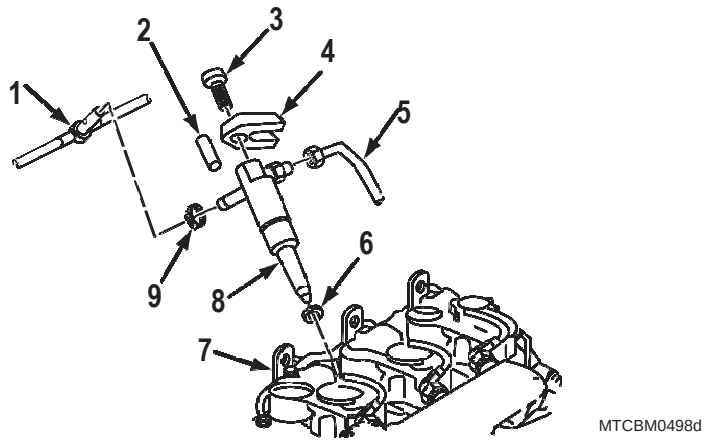

Figure 2. Fuel Injector Nozzle Replacement (EPA and Tier II).

END OF TASK

INSTALLATION (EPA AND TIER II)

1. Install new gasket (Figure 2, Item 6) on fuel injector (Figure 2, Item 8).
2. Install fuel injector (Figure 2, Item 8) on engine (Figure 2, Item 7). Ensure inlet and outlet port are positioned correctly.
3. Install bracket (Figure 2, Item 4), lockpin (Figure 2, Item 2), and screw (Figure 2, Item 3) on fuel injector (Figure 2, Item 8).
4. Install fuel injection return line (Figure 2, Item 1) and clamp (Figure 2, Item 9) on fuel injector (Figure 2, Item 8).
5. Install bracket (Figure 2, Item 4) on fuel injection line (Figure 2, Item 5) to fuel injector (Figure 2, Item 8) and torque nut.

END OF TASK

FOLLOW ON TASK

Install engine (WP 0176).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE FUEL PUMP ASSEMBLY MAINTENANCE (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 85)
Nuts, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 161)
Rags, Wiping (WP 0293, Table 1, Item 20)

Materials/Parts (cont.)
Strainer, Fuel (WP 0295, Table 1, Item 86)
Washer, Lock
Qty: (4) (WP 0295, Table 1, Item 189)

Equipment Condition
Negative battery cables disconnected (WP 0098)
Semitrailer uncoupled (WP 0007)
Drain fuel system (WP 0201)

WARNING

When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

- There are two electric fuel pumps on the semitrailer. Use this work package to replace either one.
- The fuel pumps are located on the left rear side (primary) of the engine and mounted on the rear firewall.
- Tag all lines and electrical leads prior to removal for ease of installation.

REMOVAL

1. Disconnect two fuel lines (Figure 1, Item 5) from fuel pump (Figure 1, Item 1). Plug fuel lines to prevent fuel contamination.
2. Disconnect electrical lead (Figure 1, Item 4) from fuel pump (Figure 1, Item 1).
3. Remove two screws (Figure 1, Item 3), self-locking nuts (Figure 1, Item 10), four lockwashers (Figure 1, Item 2), and fuel pump (Figure 1, Item 1) from rear firewall. Discard self-locking nuts and lockwashers (Figure 1, Item 2).

END OF TASK

DISASSEMBLY

1. Remove bottom cover (Figure 1, Item 6) from fuel pump (Figure 1, Item 1).
2. Remove gasket (Figure 1, Item 7), magnet (Figure 1, Item 8), and filter (Figure 1, Item 9) from fuel pump (Figure 1, Item 1). Discard filter (Figure 1, Item 9) and gasket (Figure 1, Item 7).

END OF TASK

ASSEMBLY

1. Install new filter (Figure 1, Item 9), magnet (Figure 1, Item 8), and new gasket (Figure 1, Item 7) in fuel pump (Figure 1, Item 1).
2. Install bottom cover (Figure 1, Item 6) on fuel pump (Figure 1, Item 1).

END OF TASK

INSTALLATION

1. Install fuel pump (Figure 1, Item 1) in place on rear firewall of semitrailer and secure with two screws (Figure 1, Item 3), four new lockwashers (Figure 1, Item 2), and two new self-locking nuts (Figure 1, Item 10).
2. Connect electrical lead (Figure 1, Item 4) to fuel pump (Figure 1, Item 1).
3. Connect two fuel lines (Figure 1, Item 5) to fuel pump (Figure 1, Item 1).

INSTALLATION - Continued

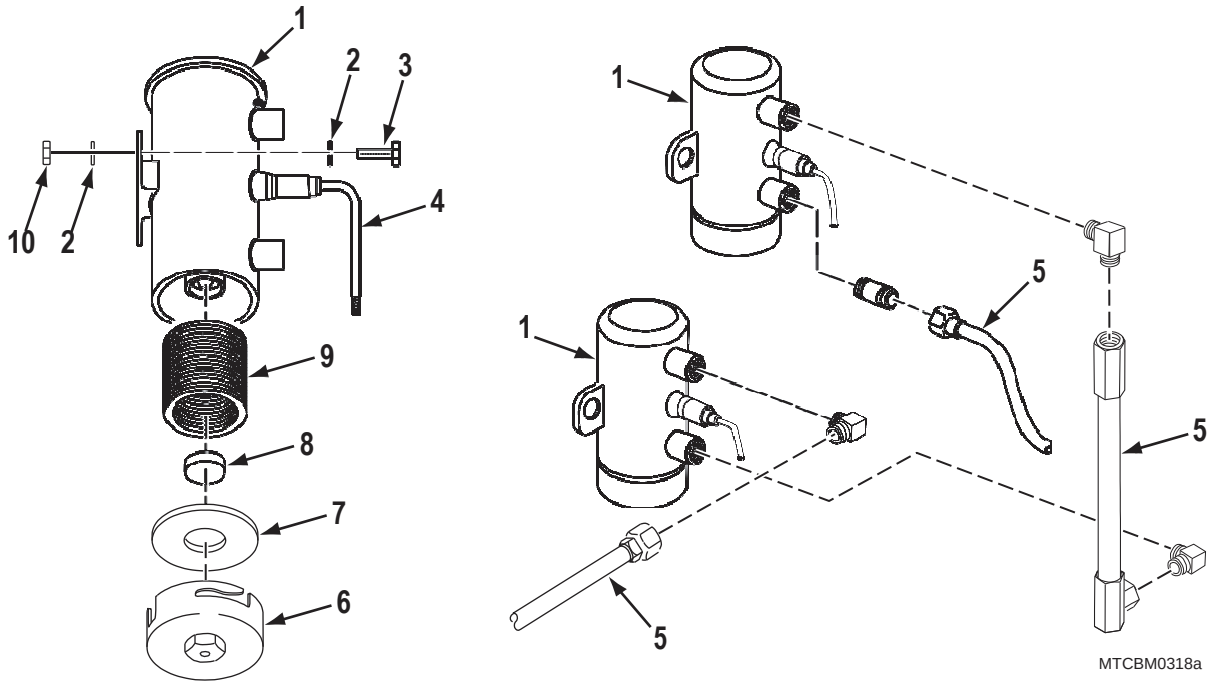

Figure 1. Fuel Pump Installation.

END OF TASK

FOLLOW ON TASK

Bleed fuel system (WP 0201).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL PUMP REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 81)
Gasket (WP 0295, Table 1, Item 123)
Rag, Wiping (WP 0293, Table 1, Item 20)

Materials/Parts (cont.)
Sealing Compound (WP 0293, Table 1, Item 22)
Washer, Lock
Qty: (2) (WP 0295, Table 1, Item 110)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

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REMOVAL (PRE-EPA/EPA)

1. Disconnect fuel line (Figure 1, Item 4) from elbow (Figure 1, Item 9) on fuel pump (Figure 1, Item 3).
2. Remove screw (Figure 1, Item 1), washer (Figure 1, Item 2), and fuel line (Figure 1, Item 8) from fuel pump (Figure 1, Item 3). Discard washer (Figure 1, Item 2).

NOTE

Gasket is used to adjust drive rod travel from crankcase. Measure and record thickness of gasket upon removal.

3. Remove two nuts (Figure 1, Item 5), fuel pump (Figure 1, Item 3), and gasket (Figure 1, Item 6) from crankcase (Figure 1, Item 7). Discard gasket (Figure 1, Item 6).
4. Remove elbow (Figure 1, Item 9) from fuel pump (Figure 1, Item 3).

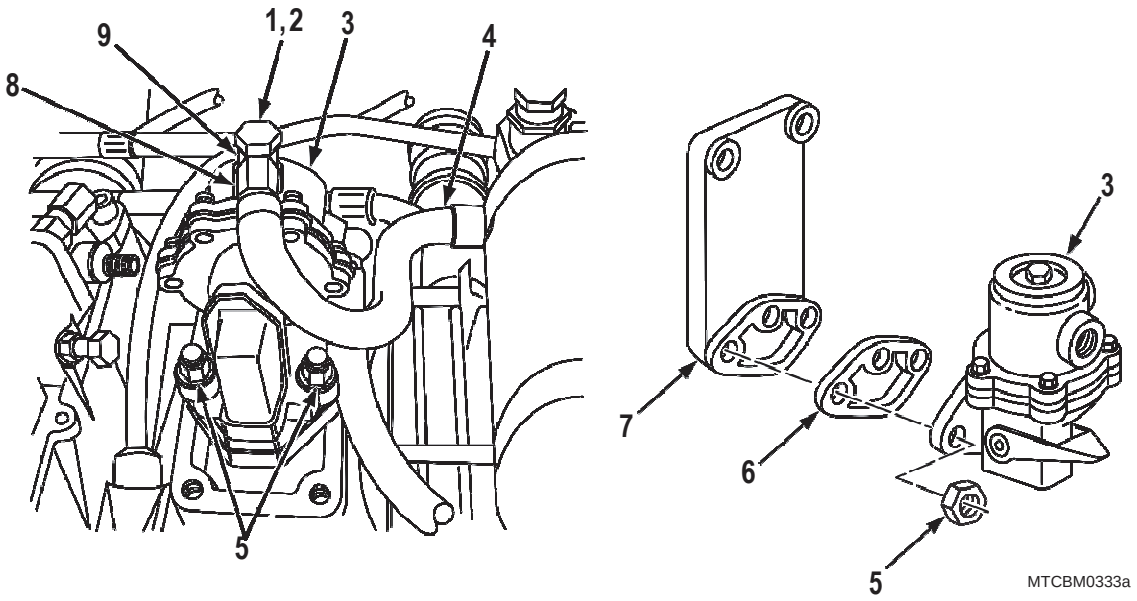


Figure 1. Fuel Pump Replacement Pre-EPA/EPA.

END OF TASK

INSTALLATION (PRE-EPA/EPA)

1. Position new gasket (Figure 1, Item 6) on crankcase (Figure 1, Item 7).
2. Apply sealing compound to threads of elbow (Figure 1, Item 9) and install on fuel pump (Figure 1, Item 3).
3. Install gasket (Figure 1, Item 6) and fuel pump (Figure 1, Item 3) on crankcase (Figure 1, Item 7) with two nuts (Figure 1, Item 5).
4. Install new washer (Figure 1, Item 2) and fuel line (Figure 1, Item 8) on fuel pump (Figure 1, Item 3) with washer (Figure 1, Item 2) and screw (Figure 1, Item 1).
5. Connect fuel line (Figure 1, Item 4) to elbow (Figure 1, Item 9) on fuel pump (Figure 1, Item 3).

END OF TASK

REMOVAL (TIER II)

1. Disconnect fuel line (Figure 2, Item 4) from elbow (Figure 2 Item 10) on fuel pump (Figure 2, Item 3).
2. Remove screw (Figure 2, Item 1), washer (Figure 2, Item 2), and fuel line (Figure 2, Item 9) from fuel pump (Figure 2, Item 3). Discard washer (Figure 2, Item 2).

NOTE

Gasket is used to adjust drive rod travel from crankcase. Measure and record thickness of gasket upon removal.

3. Remove washer (Figure 2, Item 6), screw (Figure 2, Item 5), fuel pump (Figure 2, Item 3), and gasket (Figure 2, Item 7) from crankcase (Figure 2, Item 8). Discard gasket (Figure 1, Item 7).
4. Remove elbow (Figure 2, Item 10) from fuel pump (Figure 2, Item 3).

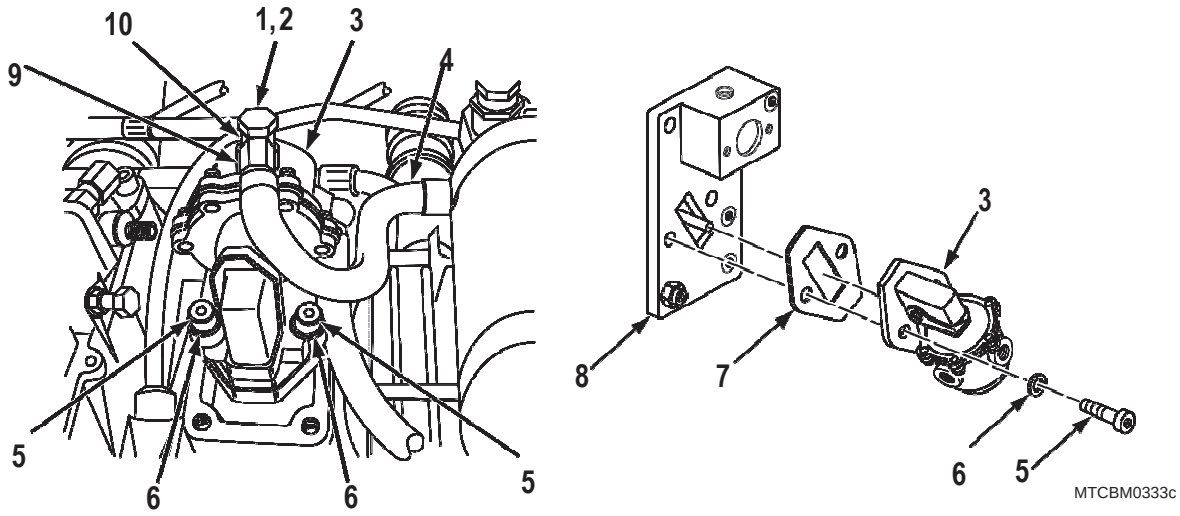


Figure 2. Fuel Pump Replacement (Tier II).

END OF TASK

INSTALLATION (TIER II)

1. Position new gasket (Figure 2, Item 7) on crankcase (Figure 2, Item 8).
2. Apply sealing compound to threads of elbow (Figure 2, Item 10) and install on fuel pump (Figure 2, Item 3).
3. Install gasket (Figure 2, Item 7) and fuel pump (Figure 1, Item 3) on crankcase (Figure 2, Item 8) with washer (Figure 2, Item 6), and screw (Figure 2, Item 5).
4. Install fuel line (Figure 2, Item 9) on fuel pump (Figure 2, Item 3) with new washer (Figure 2, Item 2) and screw (Figure 2, Item 1).
5. Connect fuel line (Figure 2, Item 4) to elbow (Figure 2, Item 10) on fuel pump (Figure 2, Item 3).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE INTAKE AIR CLEANER REPAIR (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (4) (WP 0295, Table 1, Item 128)

Equipment Condition
Semitrailer uncoupled (WP 0007)

DISASSEMBLY

1. Remove dust cap (Figure 1, Item 6) from air cleaner (Figure 1, Item 7).
2. Remove hose clamp (Figure 1, Item 2) and air intake hose (Figure 1, Item 1) from air cleaner (Figure 1, Item 7).
3. Remove four screws (Figure 1, Item 4), eight flatwashers (Figure 1, Item 3), and four self-locking nuts (Figure 1, Item 9) from two loop clamps (Figure 1, Item 5). Discard self-locking nuts (Figure 1, Item 9).
4. Remove air cleaner (Figure 1, Item 7) and loop clamps (Figure 1, Item 5) from semitrailer.
5. Loosen two screws (Figure 1, Item 8) and remove loop clamps (Figure 1, Item 5) from air cleaner (Figure 1, Item 7).

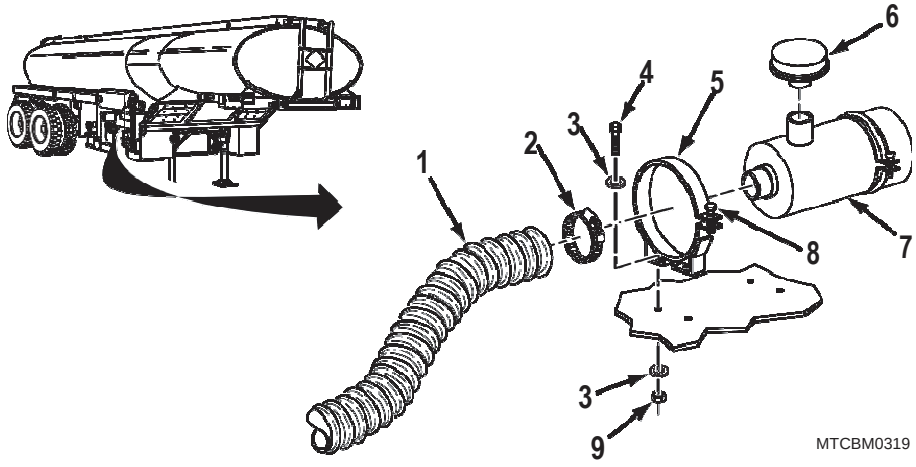


Figure 1. Air Cleaner Disassembly.

END OF TASK

ASSEMBLY

1. Install two loop clamps (Figure 2, Item 5) on air cleaner (Figure 2, Item 7). Snug, but do not tighten two screws (Figure 2, Item 8).
2. Install air cleaner (Figure 2, Item 7) and two loop clamps (Figure 2, Item 5) in place on semitrailer and secure with four screws (Figure 2, Item 4), eight flatwashers (Figure 2, Item 3), and four new self-locking nuts (Figure 2, Item 9).
3. Install dust cap (Figure 2, Item 6) on air cleaner (Figure 2, Item 7).
4. Rotate air cleaner (Figure 2, Item 7) in loop clamps (Figure 2, Item 5) until dust cap (Figure 2, Item 6) is pointing straight up. Tighten two screws (Figure 2, Item 8) on loop clamps (Figure 2, Item 5).
5. Install air intake hose (Figure 2, Item 1) on air cleaner (Figure 2, Item 7) and secure with hose clamp (Figure 2, Item 2).

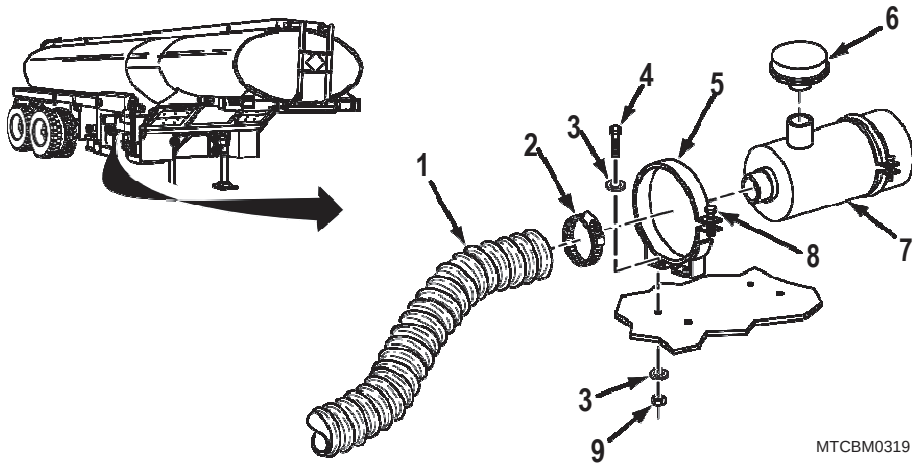


Figure 2. Air Cleaner Assembly.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE AIR FILTER ELEMENT REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Equipment Condition
Semitrailer uncoupled WP 0007

Materials/Parts
Rag, Wiping (WP 0293, Table 1, Item 20)

WARNING

If Nuclear, Biological, and Chemical (NBC) exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your NBC Officer for appropriate handling or disposal instructions. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

REMOVAL

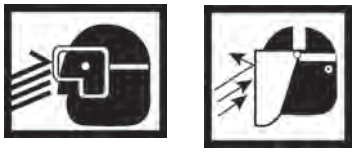
1. Loosen air cleaner housing clamp (Figure 1, Item 4) and remove dust cap (Figure 1, Item 5) from air cleaner (Figure 1, Item 6).
2. Empty dust and debris collected in dust cap (Figure 1, Item 5).
3. Remove wingnut (Figure 1, Item 3), filter cap (Figure 1, Item 2), and filter element (Figure 1, Item 1) from air cleaner (Figure 1, Item 6).

END OF TASK

CLEANING AND INSPECTION

1. Check filter element (Figure 1, Item 1) for holes, rips, or tears. If damaged, replace filter element (Figure 1, Item 1). If dirty or clogged, perform Step 2.

WARNING



Compressed air used for drying or cleaning purposes should not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., protective eyewear, gloves). Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

2. Clean filter element (Figure 1, Item 1) with low-pressure compressed air directed inside the filter element (Figure 1, Item 1).
3. Wipe inside of air cleaner (Figure 1, Item 6) with clean, damp rag.

END OF TASK

INSTALLATION

1. Install filter element (Figure 1, Item 1) and filter cap (Figure 1, Item 2) in air cleaner (Figure 1, Item 6) and secure with wingnut (Figure 1, Item 3).
2. Install dust cap (Figure 1, Item 5) on air cleaner (Figure 1, Item 6) and secure with air cleaner housing clamp (Figure 1, Item 4).

INSTALLATION - Continued

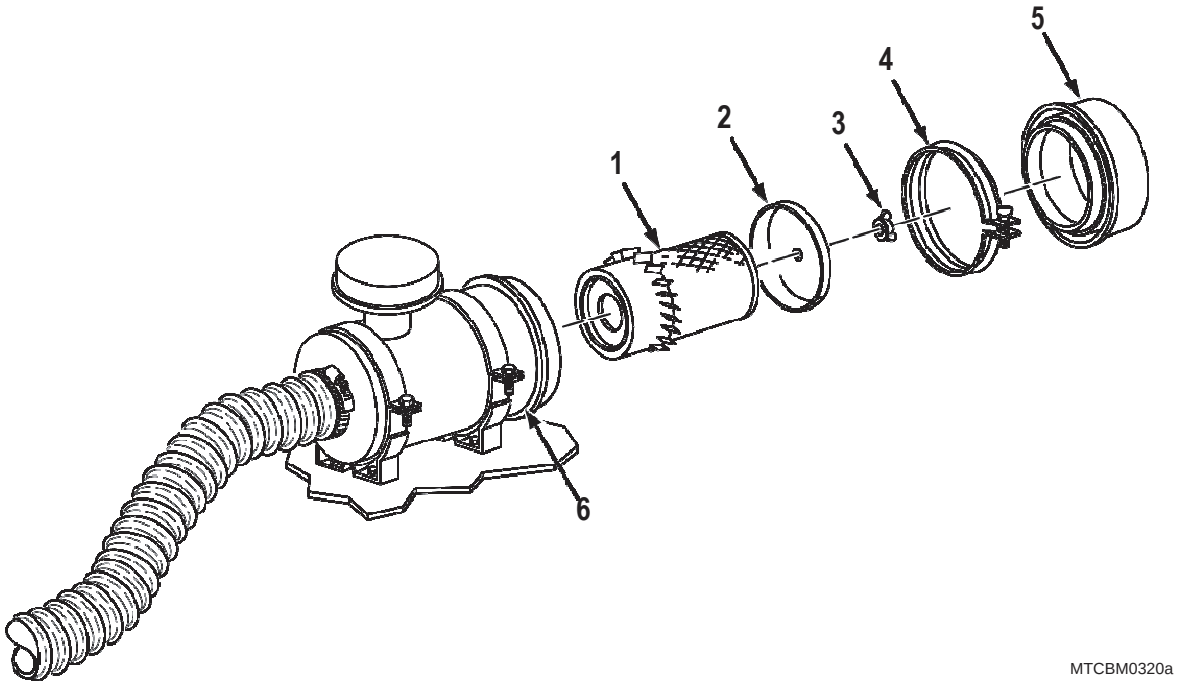


Figure 1. Air Cleaner Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AIR CLEANER RESTRICTION INDICATOR AND TUBE REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's

Equipment Condition
Air cleaner assembly removed (WP 0194)

References
TM 9-2330-339-23P

NOTE

Fluid flow restrictor consists of three pieces. Refer to TM 9-2330-339-23P.

REMOVAL

1. Remove restriction indicator line (Figure 1, Item 3) from fluid flow restrictor (Figure 1, Item 2) and air cleaner (Figure 1, Item 5).
2. Remove fluid flow restrictor (Figure 1, Item 2) and restrictor indicator (Figure 1, Item 1) from engine fan shroud (Figure 1, Item 4).

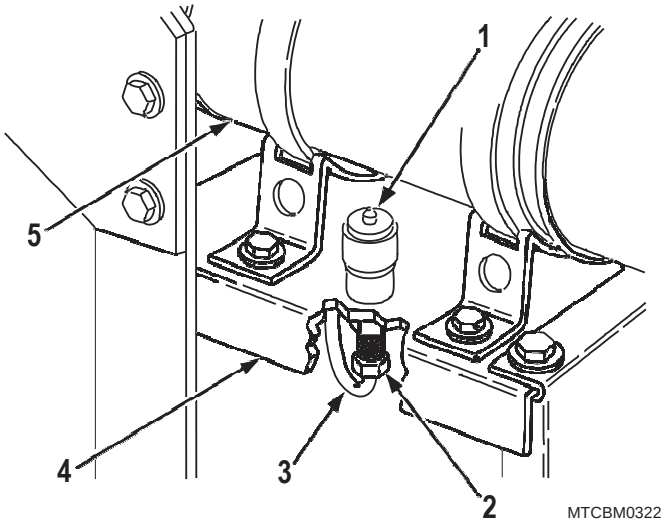


Figure 1. Restriction Indicator and Line Removal.

END OF TASK

INSTALLATION

1. Install fluid flow restrictor (Figure 2, Item 2) and restrictor indicator (Figure 2, Item 1) on engine fan shroud (Figure 2, Item 4).
2. Install restriction indicator line (Figure 2, Item 3) on fluid flow restrictor (Figure 2, Item 2) and air intake manifold (Figure 2, Item 5).

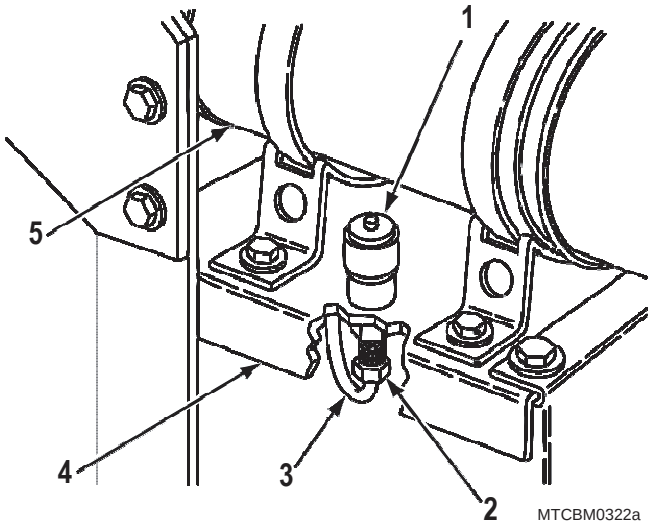


Figure 2. Restriction Indicator and Line Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AIR DUCT HOSE REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive

Equipment Condition
Raise and secure engine cabinet door (WP 0145)
Semitrailer uncoupled WP 0005

REMOVAL

1. Loosen clamp (Figure 1, Item 4) and disconnect air duct hose (Figure 1, Item 3) from intake manifold (Figure 1, Item 5).
2. Loosen clamp (Figure 1, Item 2) and disconnect air duct hose (Figure 1, Item 3) from air cleaner (Figure 1, Item 1) and remove air duct hose (Figure 1, Item 3) from vehicle.
3. Remove two clamps (Figure 1, Items 2 and 4) from air duct hose (Figure 1, Item 3).

END OF TASK

INSTALLATION

1. Install two clamps (Figure 1, Items 2 and 4) on air duct hose (Figure 1, Item 3).
2. Install air duct hose (Figure 1, Item 3) on air cleaner (Figure 1, Item 1) and tighten clamp (Figure 1, Item 2).
3. Install air duct hose (Figure 1, Item 3) on air intake manifold (Figure 1, Item 5) and tighten clamp (Figure 1, Item 4).

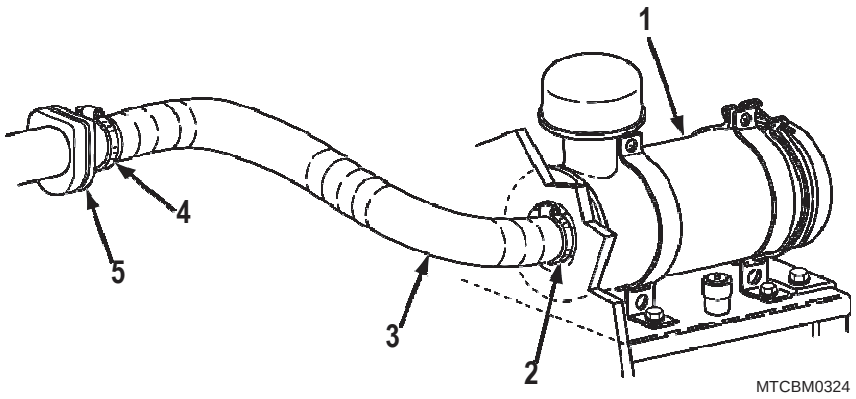


Figure 1. Air Duct Hose Replacement.

END OF TASK

FOLLOW ON TASK

Close engine cabinet door (WP 0161).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE INTAKE AIR CLEANER SERVICE (ONAN)

INITIAL SETUP:

Materials/Parts
Rag, Wiping
(WP 0293, Table 1, Item 20)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

CAUTION

Do not run engine if red band is showing in restriction indicator. Damage to engine could result. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Service air cleaner whenever restriction indicator shows a red band.

1. To service filter, loosen clamp (Figure 1, Item 5) and remove filter end cap (Figure 1, Item 4) from air cleaner body (Figure 1, Item 8).

CAUTION

Never run engine with filter or dust collector removed. Damage to engine could result. Failure to comply may result in damage to, or destruction of, equipment or mission.

2. Remove wingnut (Figure 1, Item 3), washer (Figure 1, Item 2), and cap (Figure 1, Item 6) from air cleaner body (Figure 1, Item 8).
3. Remove filter element (Figure 1, Item 7) from air cleaner body (Figure 1, Item 8).
4. Remove rain cap (Figure 1, Item 1) from air cleaner body (Figure 1, Item 8).

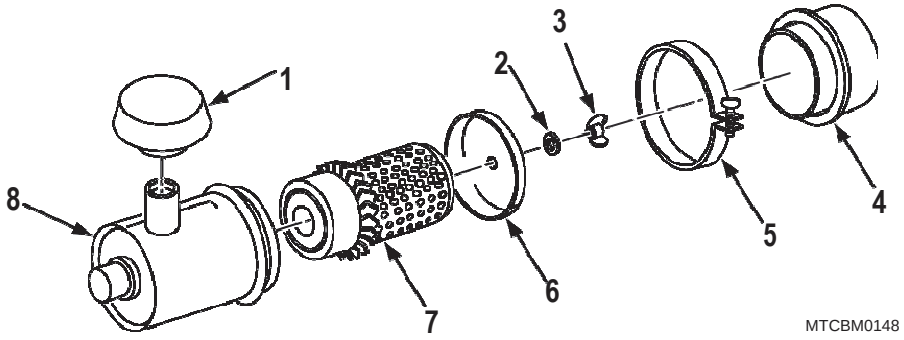


Figure 1. Air Cleaner Removal.

END OF TASK

CLEANING AND INSPECTION

1. Remove any accumulated dirt.
2. Use a clean dry rag to wipe clean the interior of air cleaner and end cap.
3. Use a clean dry rag to wipe obstructions and dirt from filter element. After six cleanings, or annually, replace filter element.
4. Clean rain cap with clean dry rag.

END OF TASK

INSTALLATION

1. Install baffle (Figure 2, Item 5) in end cap (Figure 2, Item 4).
2. Install new or cleaned filter element (Figure 2, Item 8) and cap (Figure 2, Item 7) in air cleaner body (Figure 2, Item 9). Fasten in place with washer (Figure 2, Item 2) and wingnut (Figure 2, Item 3).
3. Install end cap (Figure 2, Item 4) on air cleaner body (Figure 2, Item 9). Make sure portion of end cap marked “TOP" is at top. Secure end cap (Figure 2, Item 4) by tightening clamp (Figure 2, Item 6).
4. Install rain cap (Figure 2, Item 1) on air cleaner body (Figure 2, Item 9).
5. Press button on air restriction indicator (Figure 2, Item 10) to reset red band.

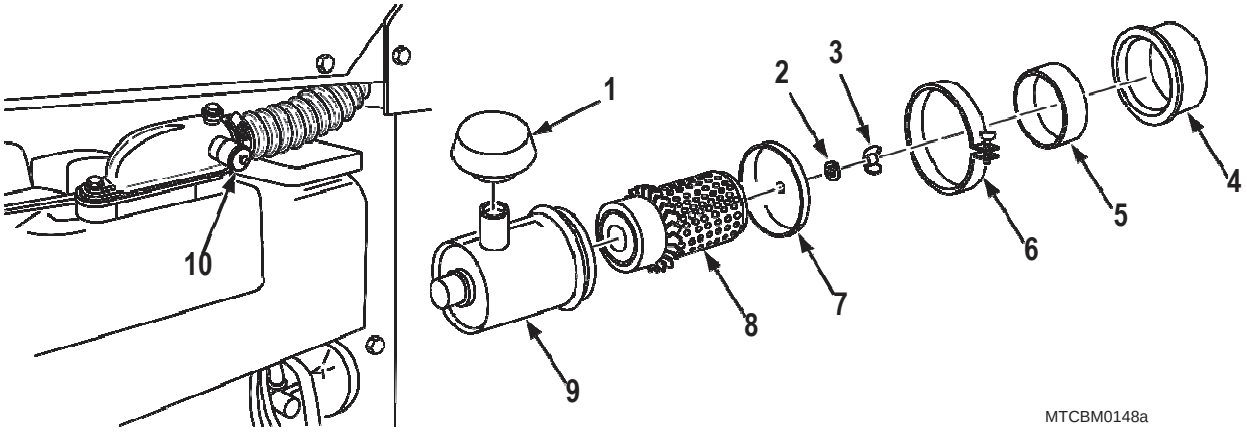


Figure 2. Air Cleaner Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AIR CLEANER RESTRICTION INDICATOR REPLACEMENT (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Remove restriction indicator (Figure 1, Item 3) from pipe coupling (Figure 1, Item 2).
2. Remove pipe coupling (Figure 1, Item 2) from fluid flow indicator restrictor (Figure 1, Item 1).

END OF TASK

INSTALLATION

1. Install pipe coupling (Figure 1, Item 2) in fluid flow indicator restrictor (Figure 1, Item 1).
2. Install restriction indicator (Figure 1, Item 3) on pipe coupling (Figure 1, Item 2).

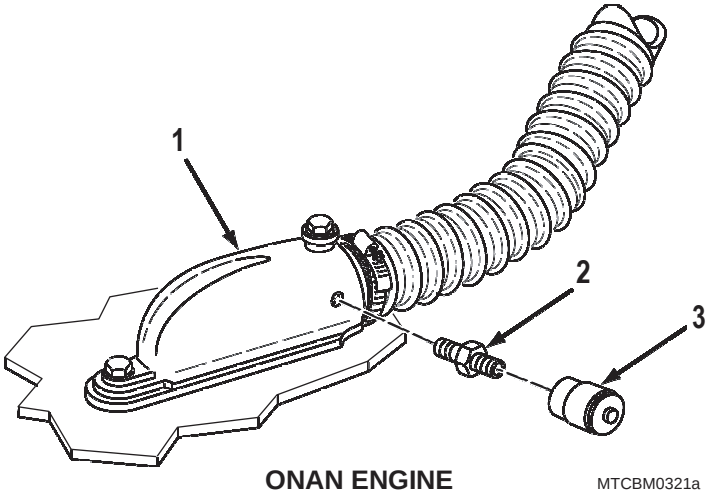


Figure 1. Air Cleaner Restriction Indicator Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AIR DUCT HOSE AND PIPE COUPLING REPLACEMENT (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's

Materials/Parts
Gasket
Washer, Lock
Qty: (2)

Equipment Condition
Remove air cleaner restriction indicator (WP 0199)
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Loosen two hose clamps (Figure 1, Item 2) and remove air duct hose (Figure 1, Item 1) from pipe coupling (Figure 1, Item 5) and air cleaner (Figure 1, Item 3).
2. Remove screws (Figure 1, Item 7), lockwashers (Figure 1, Item 6), pipe coupling (Figure 1, Item 5), and gasket (Figure 1, Item 4) from engine. Discard lockwashers (Figure 1, Item 6) and gasket (Figure 1, Item 4).

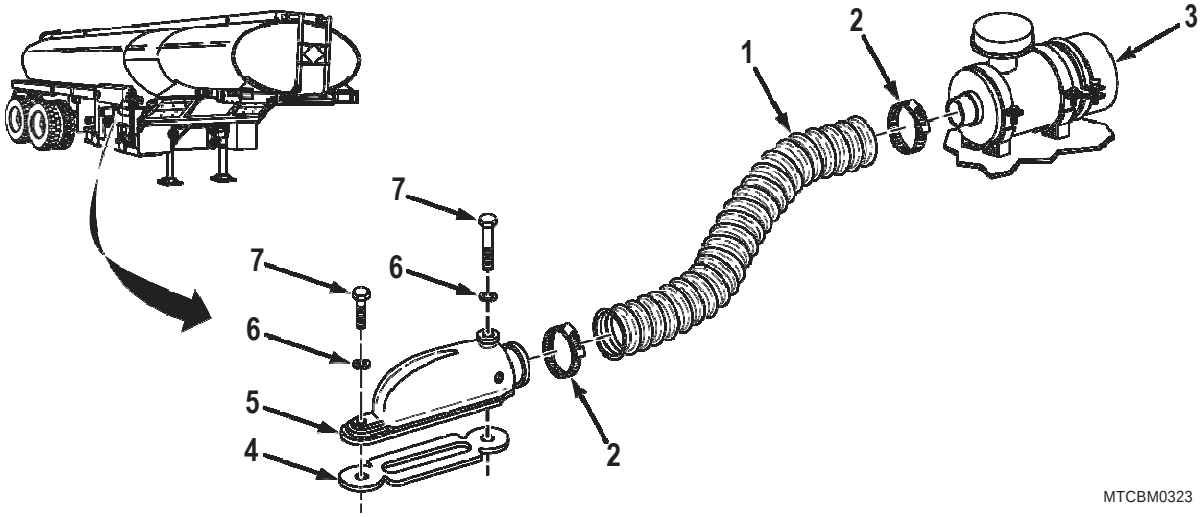


Figure 1. Air Duct Hose Removal.

END OF TASK

INSTALLATION

1. Position pipe coupling (Figure 2, Item 5) and new gasket (Figure 2, Item 4) in place and secure with screws (Figure 2, Item 7) and two new lockwashers (Figure 2, Item 6).
2. Install air duct hose (Figure 2, Item 1) on air cleaner (Figure 2, Item 3) and pipe coupling (Figure 2, Item 5) and secure with two hose clamps (Figure 2, Item 2).

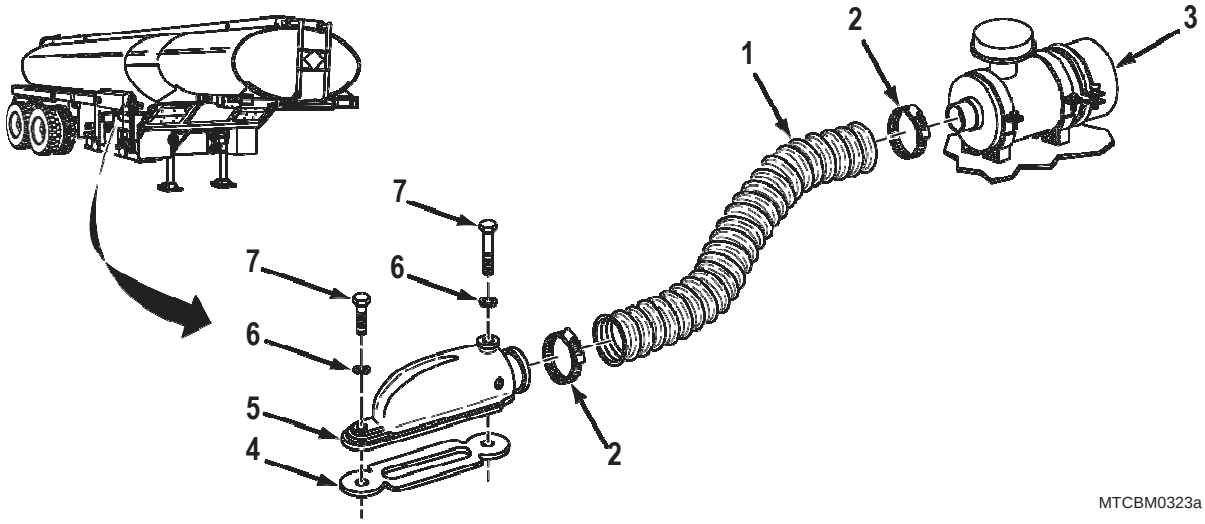


Figure 2. Air Duct Hose Installation.

END OF TASK

FOLLOW ON TASK

Install air cleaner restriction indicator (WP 0199).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE FUEL TANK MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

Materials/Parts
Rag, Wiping (WP 0293, Table 1, Item 20)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Tag all lines prior to removal for ease of installation.

REMOVAL

1. Remove drain plug (Figure 1, Item 10). Drain fuel into container.
2. Disconnect two fuel lines (Figure 1, Items 13) from top of fuel tank (Figure 1, Item 6). Plug fuel lines (Figure 1, Items 13) to prevent contamination of fuel.
3. Remove two elbows (Figure 1, Item 1) and bushings (Figure 1, Items 2 and 3) from fuel tank (Figure 1, Item 6).
4. Remove screw (Figure 1, Item 8), washer (Figure 1, Item 9), and ground cable (Figure 1, Item 7) from fuel tank (Figure 1, Item 6).
5. Remove four screws (Figure 1, Item 12), washers (Figure 1, Item 11), two mounting straps (Figure 1, Item 5), and ground cable (Figure 1, Item 7) from fuel tank (Figure 1, Item 6) and semitrailer.
6. Remove fuel tank (Figure 1, Item 6) from semitrailer.

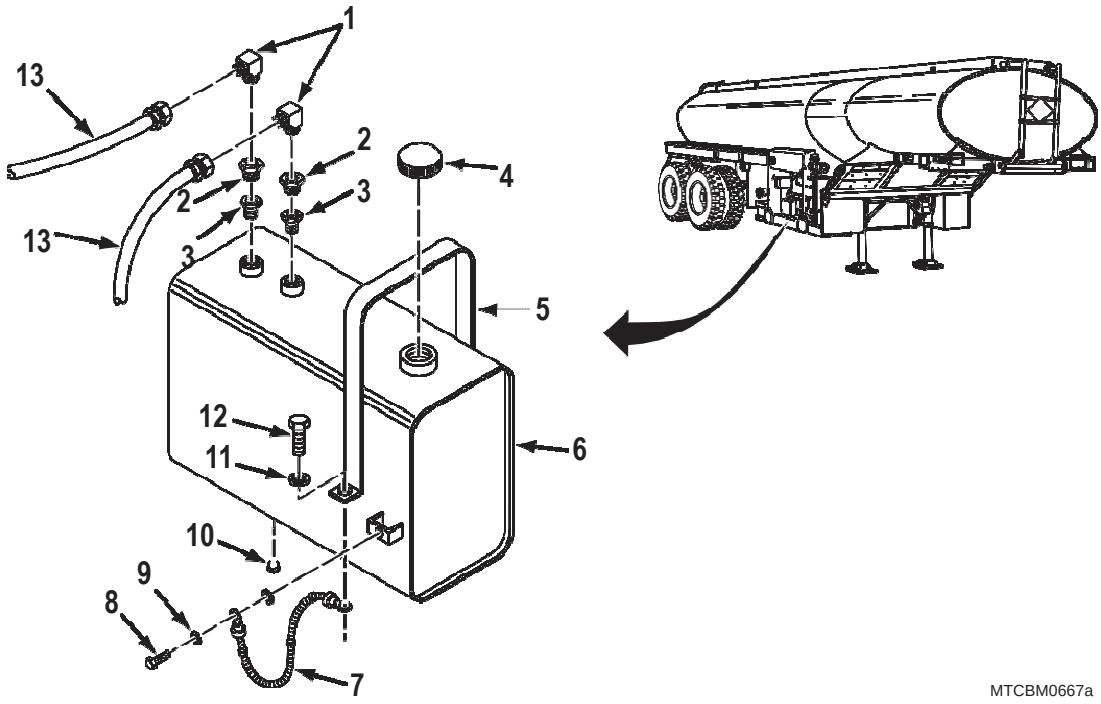


Figure 1. Engine Fuel Tank Replacement.

END OF TASK

INSTALLATION

1. Install drain plug (Figure 1, Item 10) in fuel tank (Figure 1, Item 6).
2. Position fuel tank (Figure 1, Item 6) in place on semitrailer and secure with four screws (Figure 1, Item 12), washers (Figure 1, Item 11), two mounting straps (Figure 1, Item 5), and ground cable (Figure 1, Item 7).
3. Install screw (Figure 1, Item 8), washer (Figure 1, Item 9), and ground cable (Figure 1, Item 7) on fuel tank (Figure 1, Item 6).
4. Install two elbows (Figure 1, Item 1) and bushings (Figure 1, Items 2 and 3) on fuel tank (Figure 1, Item 6).
5. Connect two fuel lines (Figure 1, Items 13) to top of fuel tank (Figure 1, Item 6).

INSTALLATION - Continued

6. Remove fuel tank cap (Figure 1, Item 4) and fill fuel tank (Figure 1, Item 6) with fresh fuel, then install fuel tank cap (Figure 1, Item 4).

END OF TASK

BLEED FUEL SYSTEM

NOTE

Perform Steps 1 through 4 for Onan engine. Perform Steps 5 through 10 for Lombardini engine. Engine will not run until all air is removed from fuel system.

1. Disconnect fuel return line (Figure 2, Item 2) from one fuel injection pump (Figure 2, Item 1).
2. Turn engine switch (Figure 2, Item 3) to RUN position to energize the electrical system and fuel injection pump (Figure 2, Item 1).
3. Run fuel injection pump (Figure 2, Item 1) until there are no air bubbles visible in the fuel flowing from the fuel injection pump (Figure 2, Item 1).
4. Turn engine switch (Figure 2, Item 3) to OFF.

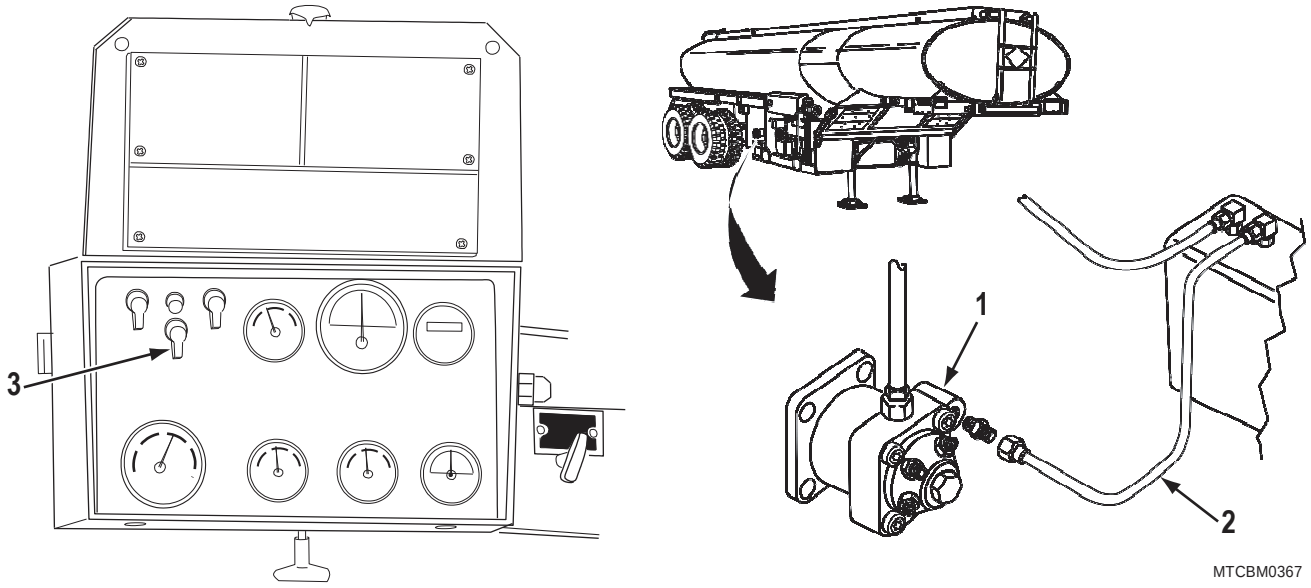


Figure 2. Fuel System Bleed.

BLEED FUEL SYSTEM - Continued

5. Connect fuel return line (Figure 3, Item 1) to fuel injection pump (Figure 3, Item 4).
6. Loosen the slotted bleeder screw (Figure 3, Item 2) on the top of fuel filter housing.
7. Actuate the manual lever (Figure 3, Item 3) on fuel pump (Figure 3, Item 4) until a steady flow of fuel is seen.
8. Close bleeder screw (Figure 3, Item 2).
9. Continue actuating fuel pump lever (Figure 3, Item 3) until fuel is heard returning to fuel tank. At this point, there may be sufficient air purged from fuel system that the engine will start and run.

CAUTION

Do not run the engine for more than two minutes if you do not have fuel in tanker to keep the pump lubricated. Failure to comply may result in damage to, or destruction of, equipment or mission.

10. Start engine. Check operation of engine and gages. Check for engine oil and fuel leaks.

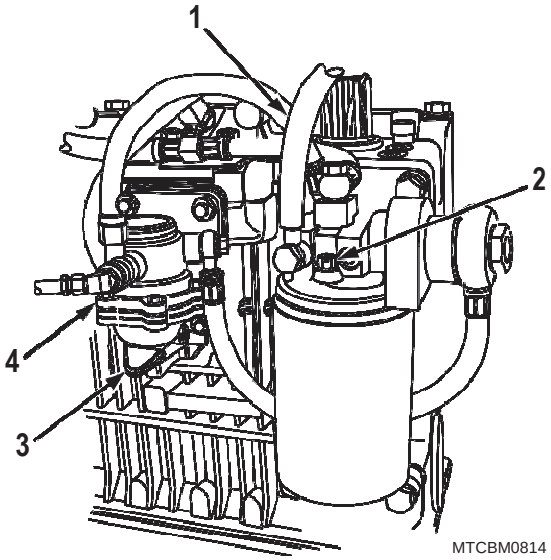


Figure 3. Fuel Injection Pump.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE FUEL LINES AND FITTINGS REPLACEMENT (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

NOTE

Cap or plug all fuel lines, fittings, or fuel system component ports immediately after disconnecting to prevent contamination.

1. Disconnect hose assembly (Figure 1, Item 3) from adapter (Figure 1, Item 2) and elbow (Figure 1, Item 4).
2. Remove elbow (Figure 1, Item 4) and pipe bushings (Figure 1, Items 7 and 8) from fuel tank (Figure 1, Item 10) and adapter (Figure 1, Item 2) from upper fuel pump assembly (Figure 1, Item 21).
3. Disconnect hose assembly (Figure 1, Item 18) from elbows (Figure 1, Items 1 and 16). Remove elbows (Figure 1, Items 1 and 16) from upper and lower fuel pump assemblies (Figure 1, Items 20 and 21).
4. Disconnect hose assembly (Figure 1, Item 19) from elbows (Figure 1, Items 15 and 16). Remove elbow (Figure 1, Item 17) from lower fuel pump assembly (Figure 1, Item 20).
5. Disconnect adapter (Figure 1, Item 13) from tube nipple (Figure 1, Item 12). Remove tube nipple (Figure 1, Item 12) from fuel injection pump (Figure 1, Item 14).
6. Disconnect adapter (Figure 1, Item 5) on other end of hose (Figure 1, Item 11) from elbow (Figure 1, Item 6).
7. Remove elbow (Figure 1, Item 6) and pipe bushings (Figure 1, Items 7 and 8) from fuel tank (Figure 1, Item 10).

END OF TASK

INSTALLATION

1. Install pipe bushings (Figure 1, Items 7 and 8) and elbow (Figure 1, Item 6) in fuel tank (Figure 1, Item 10).
2. Connect hose (Figure 1, Item 11) and adapter (Figure 1, Item 5) to elbow (Figure 1, Item 6).
3. Install tube nipple (Figure 1, Item 12) in fuel injection pump (Figure 1, Item 14). Connect adapter (Figure 1, Item 5) on other end of hose (Figure 1, Item 11) to tube nipple (Figure 1, Item 12).
4. Install elbow (Figure 1, Item 15) in lower fuel pump assembly (Figure 1, Item 20). Connect hose assembly (Figure 1, Item 19) to elbows (Figure 1, Items 15 and 16).
5. Install elbows (Figure 1, Items 1 and 17) in upper and lower fuel pump assemblies (Figure 1, Items 20 and 21). Connect hose assembly (Figure 1, Item 18) to elbows (Figure 1, Items 1 and 17).
6. Install adaptor (Figure 1, Item 2) in upper fuel pump assembly (Figure 1, Item 21). Connect one end of hose assembly (Figure 1, Item 3) to adapter (Figure 1, Item 2).
7. Install pipe bushings (Figure 1, Items 7 and 8) in fuel tank (Figure 1, Item 10). Install elbow (Figure 1, Item 4) in pipe bushing (Figure 1, Item 8). Connect other end of hose assembly (Figure 1, Item 3) to elbow (Figure 1, Item 4).

INSTALLATION - Continued

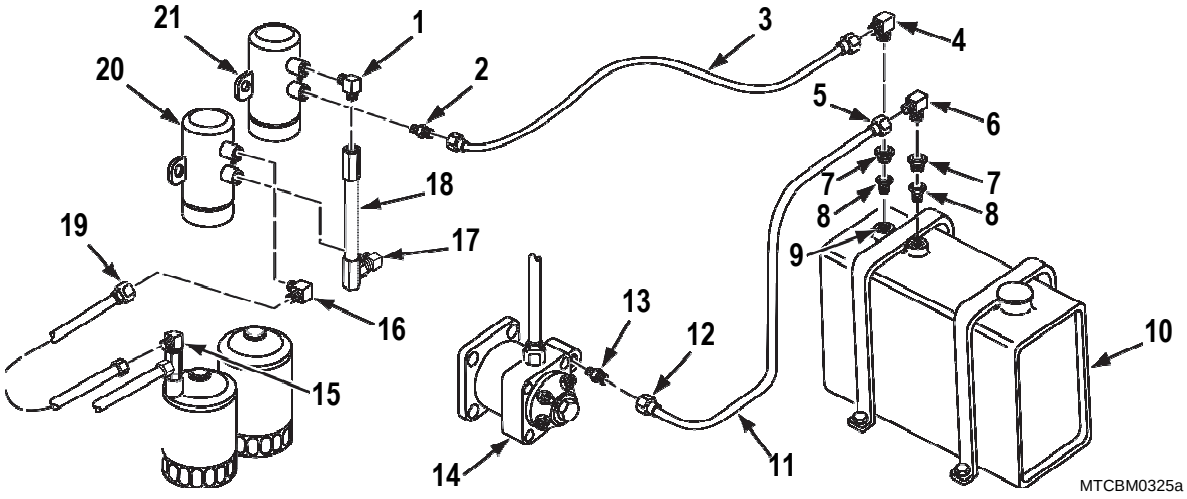


Figure 1. Engine Fuel Line and Fitting Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL TANK LINES AND FITTINGS REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

Materials/Parts
Rag, Wiping (WP 0293, Table 1, Item 20)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

FUEL SUPPLY LINES REMOVAL

1. Disconnect fuel supply line (Figure 1, Item 2) from elbow (Figure 1, Item 1) at fuel tank (Figure 1, Item 12).
2. Remove screw (Figure 1, Item 3), two washers (Figure 1, Item 4), and fuel supply line (Figure 1, Item 2) from fuel pump (Figure 1, Item 5).
3. Remove screw (Figure 1, Item 6), two washers (Figure 1, Item 7), and fuel pump to fuel filter line (Figure 1, Item 11) from fuel pump (Figure 1, Item 5).
4. Remove screw (Figure 1, Item 8), two washers (Figure 1, Item 9), and fuel pump to fuel filter line (Figure 1, Item 11) from fuel filter housing (Figure 1, Item 10).

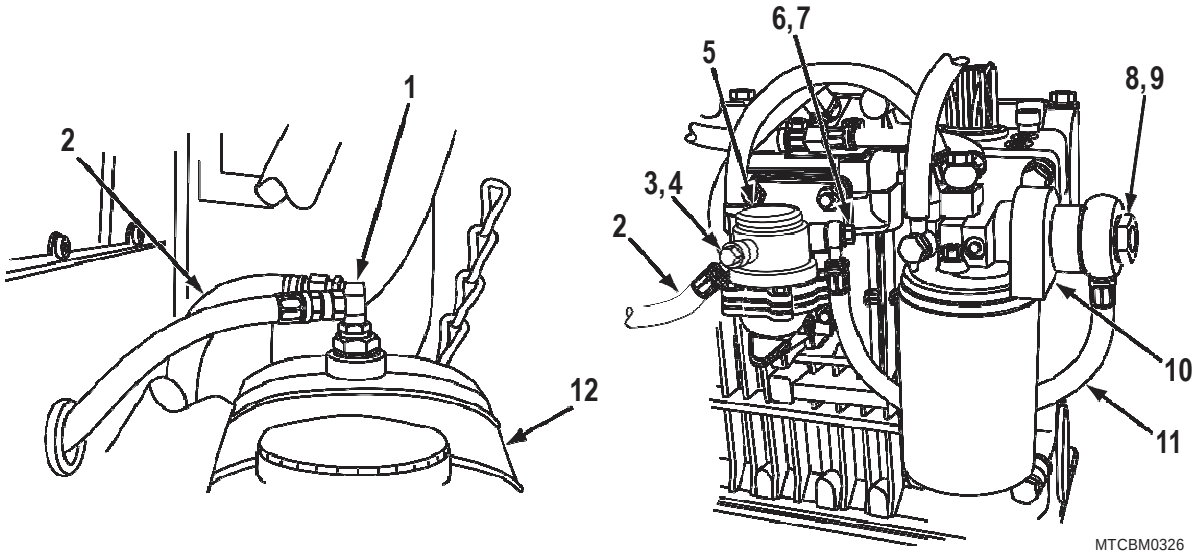


Figure 1. Fuel Supply Lines Replacement.

END OF TASK

FUEL RETURN LINE REMOVAL

1. Remove clamp (Figure 2, Item 2) and fuel return line (Figure 2, Item 5) from engine.
2. Remove fuel return line (Figure 2, Item 5) from fittings (Figure 2, Items 3 and 4).
3. Disconnect fuel return line (Figure 2, Item 5) from elbow (Figure 2, Item 1) on fuel tank and remove fuel return line (Figure 2, Item 5) from grommet (Figure 2, Item 6) on engine shroud (Figure 2, Item 7).

FUEL RETURN LINE REMOVAL - Continued

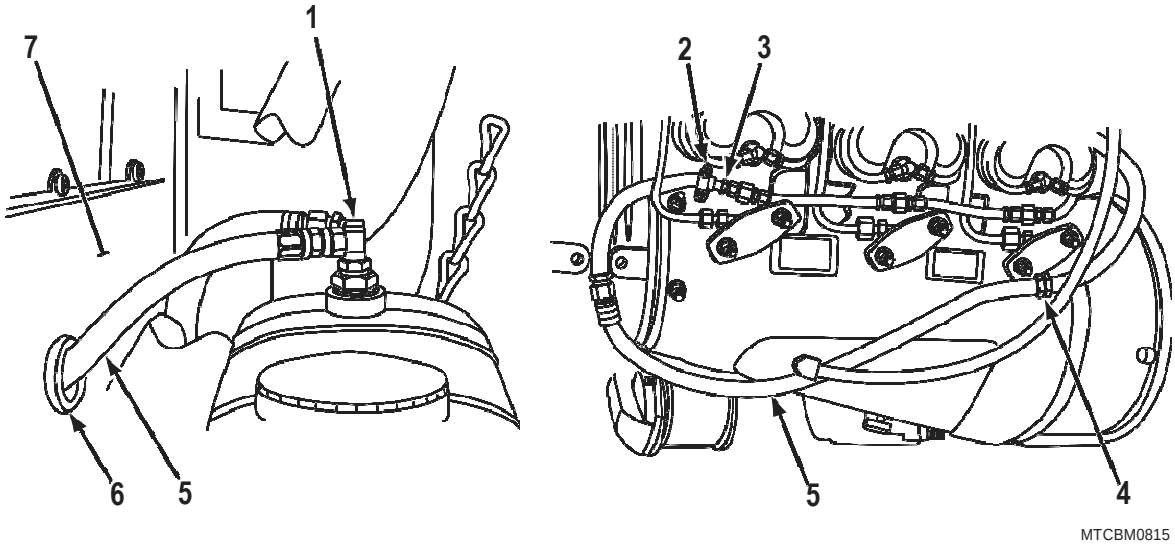


Figure 2. Fuel Return Lines Replacement.

END OF TASK

FUEL RETURN LINE INSTALLATION

1. Connect fuel return line (Figure 2, Item 5) to elbow (Figure 2, Item 1) on fuel tank.
2. Route fuel return line (Figure 2, Item 5) through grommet (Figure 2, Item 6) on engine shroud (Figure 2, Item 7) and install on fittings (Figure 2, Items 3 and 4) with clamp (Figure 2, Item 2).
3. Install fuel return line (Figure 2, Item 5) on engine with clamp (Figure 2, Item 2).

END OF TASK

FUEL SUPPLY LINES INSTALLATION

1. Install screw (Figure 1, Item 8), two washers (Figure 1, Item 9), and fuel pump to fuel filter line (Figure 1, Item 11) on fuel filter housing (Figure 1, Item 10).
2. Install fuel pump to fuel filter line (Figure 1, Item 11) on fuel pump (Figure 1, Item 5) with two washers (Figure 1, Item 7) and screw (Figure 1, Item 6).
3. Install fuel supply line (Figure 1, Item 2) on fuel pump (Figure 1, Item 5) with screw (Figure 1, Item 3) and two washers (Figure 1, Item 4).
4. Connect fuel supply line (Figure 1, Item 2) to elbow (Figure 1, Item 1) at fuel tank (Figure 1, Item 12).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LOMBARDINI ENGINE SPEED SENSOR TIER II REPLACEMENT (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Wrench, Torque Dial
(WP 0294, Table 1, Item 27)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Negative battery cables disconnected WP 0098

Materials/Parts
Gasket (WP 0295, Table 1, Item 115)
Lubricating Oil (WP 0293, Table 1, Item 16)

WARNING

When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative and positive battery cables from batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Tag harness and connector prior to removal for ease of installation.

REMOVAL

1. Disconnect engine speed sensor harness connector (Figure 1, Item 5) from engine speed sensor (Figure 1, Item 6).
2. Remove screw (Figure 1, Item 4), washer (Figure 1, Item 3), gasket (Figure 1, Item 2), and engine speed sensor (Figure 1, Item 6) from engine. Discard gasket (Figure 1, Item 2).

END OF TASK

INSTALLATION

NOTE

Take care not to damage O-ring (Figure 1, Item 1) in engine, when installing sensor.

1. Lubricate O-ring (Figure 1, Item 1) inside sensor port (Figure 1, Item 6).
2. Position speed sensor (Figure 1, Item 6) on new gasket (Figure 1, Item 2) and install on engine with washer (Figure 1, Item 3) and screw (Figure 1, Item 4). Torque screw (Figure 1, Item 4) to 70 lb in. (8 N·m).
3. Connect speed sensor harness (Figure 1, Item 5) to engine speed sensor (Figure 1, Item 6).

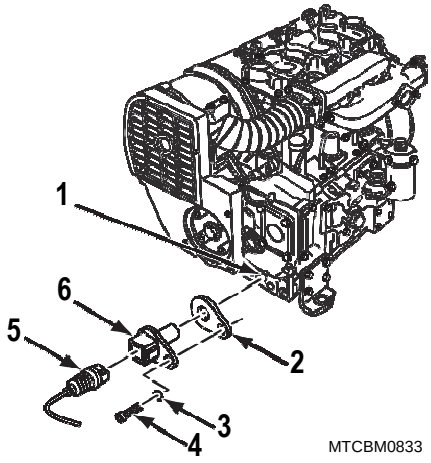


Figure 1. Engine Speed Sensor Replacement.

END OF TASK

FOLLOW ON TASK

Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LOMBARDINI ENGINE FUEL INJECTOR PUMP SENSOR TIER II REPLACEMENT
(M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Torque Dial (WP 0294, Table 1, Item 27)

Materials/Parts
Gasket (WP 0295, Table 1, Item 81)

Materials/Parts (cont.)
Gasket, Copper (WP 0295, Table 1, Item 84)
O-Ring (WP 0295, Table 1, Item 30)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Negative battery cables disconnected WP 0098

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Tag harness, connector, and fuel lines prior to removal for ease of installation.

REMOVAL

1. Disconnect fuel injector sensor harness connector (Figure 1, Item 3) from fuel injector pump sensor (Figure 1, Item 8).
2. Remove two screws (Figure 1, Item 9) holding fuel injector pump sensor (Figure 1, Item 8) to fuel injector and sensor base (Figure 1, Item 11). Do not remove fuel injector pump sensor (Figure 1, Item 8).
3. Remove three nuts (Figure 1, Item 10) from fuel injector and sensor base (Figure 1, Item 11).

NOTE

It will be necessary to rotate sensor to one side to access and remove fuel injector and sensor base screws.

4. Remove two screws (Figure 1, Item 2) from fuel injector and sensor base (Figure 1, Item 11) from engine.
5. Remove fuel injector sensor (Figure 1, Item 8) from fuel injector and sensor base (Figure 1, Item 11).
6. Remove set screw (Figure 1, Item 4), O-ring (Figure 1, Item 6), gasket (Figure 1, Item 7), and fork (Figure 1, Item 5) from fuel injector sensor (Figure 1, Item 8). Discard O-ring (Figure 1, Item 6) and gasket (Figure 1, Item 7).

END OF TASK

INSTALLATION

NOTE

Care should be taken not to damage fork (Figure 1, Item 5).

1. Install fork (Figure 1, Item 5), new O-ring (Figure 1, Item 6), and new gasket (Figure 1, Item 7) to fuel injector sensor (Figure 1, Item 8) and secure with set screw (Figure 1, Item 4).
2. Remove viewing screw (Figure 1, Item 1) from fuel injector and sensor base (Figure 1, Item 11).
3. Install fuel injector sensor (Figure 1, Item 8) to fuel injector and sensor base (Figure 1, Item 11) without hardware.

NOTE

Hold fuel injector sensor in place. Do not install hardware until after base hardware is installed.

4. While looking through viewing hole, install fuel injector and sensor base (Figure 1, Item 11) to engine, taking care to align fork (Figure 1, Item 5) while installing, and secure with two screws (Figure 1, Item 2). Torque screws (Figure 1, Item 2) to 221 lb in. (25 N·m).
5. Install three nuts (Figure 1, Item 10) to fuel injector and sensor base (Figure 1, Item 11). Torque nuts (Figure 1, Item 10) to 221 lb in. (25 N·m).
6. Install fuel injector pump sensor (Figure 1, Item 8) to fuel injector and sensor base (Figure 1, Item 11) with two screws (Figure 1, Item 9).

INSTALLATION - Continued

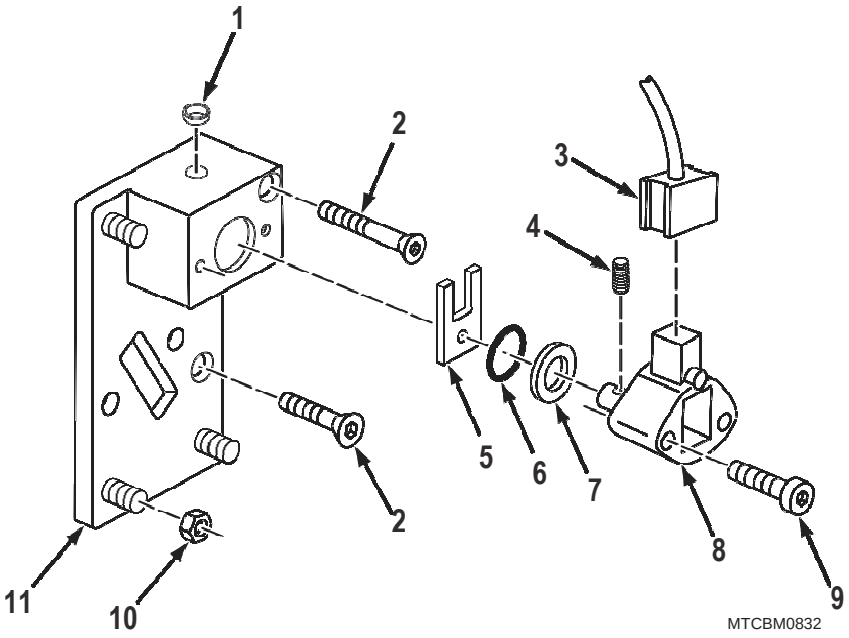


Figure 1. Fuel Injector Pump Sensor Replacement.

END OF TASK

FOLLOW ON TASK

Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LOMBARDINI ENGINE OIL PRESSURE SENSOR TIER II REPLACEMENT (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Gasket, Copper (WP 0295, Table 1, Item 82)
Lubricating Oil (WP 0293, Table 1, Item 16)

Materials/Parts (cont.)
Sealing Compound (WP 0293, Table 1, Item 22)
Tape, Antiseize (WP 0293, Table 1, Item 29)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Negative battery cables disconnected WP 0098

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Tag harness and connector prior to removal for ease of installation.

REMOVAL

1. Disconnect engine oil pressure sensor harness connector (Figure 1, Item 4) from engine oil pressure sensor (Figure 1, Item 3).
2. Remove engine oil pressure sensor (Figure 1, Item 3) from fitting (Figure 1, Item 2).
3. Remove fitting (Figure 1, Item 2) and gasket (Figure 1, Item 1) from engine. Discard gasket (Figure 1, Item 1).

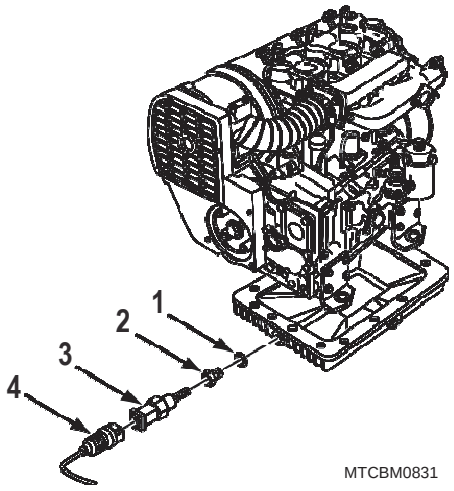


Figure 1. Engine Oil Pressure Sensor Removal.

END OF TASK

INSTALLATION

1. Lubricate gasket (Figure 1, Item 1).
2. Apply antiseize tape to threads of fitting (Figure 1, Item 2) and sealing compound to treads of oil pressure sensor (Figure 1, Item 3).
3. Install new gasket (Figure 1, Item 1) and fitting (Figure 1, Item 2) to engine.
4. Install oil pressure sensor (Figure 1, Item 3) to fitting (Figure 1, Item 2).
5. Install engine harness connector (Figure 1, Item 4) to oil pressure sensor (Figure 1, Item 3).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LOMBARDINI ENGINE PHASE SENSOR TIER II REPLACEMENT (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Torque Dial (WP 0294, Table 1, Item 27)

Materials/Parts
Lubricating Oil (WP 0293, Table 1, Item 16)
O-Ring (WP 0295, Table 1, Item 124)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Negative battery cables disconnected WP 0098

NOTE

Tag harness and connector prior to removal for ease of installation.

REMOVAL

1. Disconnect engine phase sensor harness connector (Figure 1, Item 7) from engine phase sensor (Figure 1, Item 8).

NOTE

Take care not to damage shim after removing phase sensor for reinstallation.

2. Remove screw (Figure 1, Item 6), washer (Figure 1, Item 5), engine phase sensor (Figure 1, Item 8), and shim (Figure 1, Item 4) from engine.
3. Remove three screws (Figure 1, Item 2), sensor support (Figure 1, Item 3), and O-ring (Figure 1, Item 1). Discard O-ring (Figure 1, Item 1).

END OF TASK

INSTALLATION

1. Lubricate O-ring (Figure 1, Item 1).
2. Install new O-ring (Figure 1, Item 1) and sensor support (Figure 1, Item 3) to engine with three screws (Figure 1, Item 2). Torque screws (Figure 1, Item 6) to 70.8 lb in. (8 N·m).

NOTE

Take care not to damage shim during installation of phase sensor.

3. Install phase sensor (Figure 1, Item 8) and shim (Figure 1, Item 4) on sensor support (Figure 1, Item 3) and secure with washer (Figure 1, Item 5) and screw (Figure 1, Item 6). Torque screw (Figure 1, Item 6) to 70 lb in. (8 N·m).

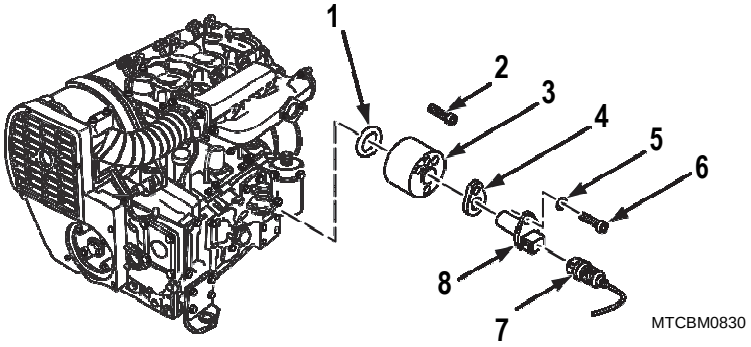


Figure 1. Engine Phase Sensor Replacement.

END OF TASK

FOLLOW ON TASK

Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LOMBARDINI (ECU) TIER II REPLACEMENT (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Negative battery cables disconnected WP 0098

NOTE

Tag harness and connector prior to removal for ease of installation.

REMOVAL

1. Remove two screws (Figure 1, Item 2) and Engine Control Unit (ECU) (Figure 1, Item 3) from ECU mounting plate (Figure 1, Item 4).
2. Disconnect engine ECU harness connector (Figure 1, Item 1) from ECU (Figure 1, Item 3).
3. Remove two screws (Figure 1, Item 5) and ECU mounting plate (Figure 1, Item 4) from engine (Figure 1, Item 6).

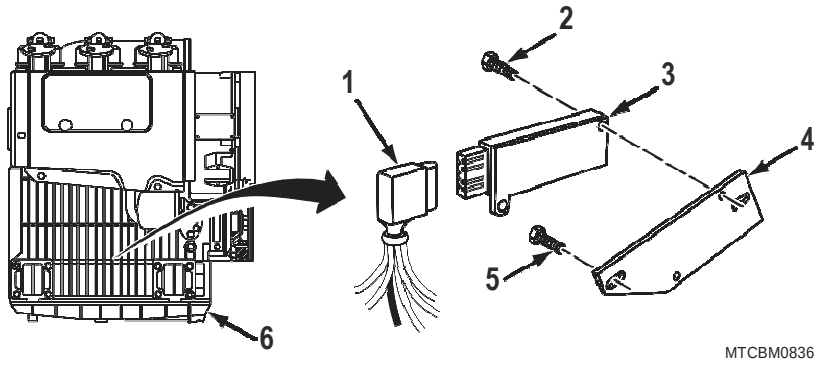


Figure 1.

END OF TASK

INSTALLATION

1. Install ECU mounting plate (Figure 1, Item 4) to engine (Figure 1, Item 6) with two screws (Figure 1, Item 5).
2. Install engine ECU harness connector (Figure 1, Item 1) to ECU (Figure 1, Item 3).
3. Install ECU (Figure 1, Item 3) to ECU mounting plate (Figure 1, Item 4) with two screws (Figure 1, Item 2).

END OF TASK

FOLLOW ON TASK

Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LOMBARDINI (ECU) HARNESS, TIER II REPLACEMENT (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Tie, Cable (WP 0295, Table 1, Item 1)

References
WP 0087

Equipment Condition
Negative battery cables disconnected (WP 0098)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Disconnect engine speed sensor connector (WP 0204)
Disconnect engine fuel injector pump sensor connector (WP 0205)
Disconnect engine oil pressure sensor connector (WP 0206)
Disconnect engine phase sensor connector (WP 0207)
Disconnect ECU connector (WP 0208)

NOTE

Tag and make note on location of each harness connector for ease of installation.

REMOVAL

1. Remove any cable ties securing engine harness (Figure 1, Item 1) to engine. Discard cable ties.
2. Disconnect engine harness connectors (Figure 1, Items 4 and 5) from input/output solenoids (Figure 1, Items 2 and 3).
3. Ensure engine harness connectors (Figure 1, Items 6 and 7) are disconnected and remove engine harness (Figure 1, Item 1) from engine.

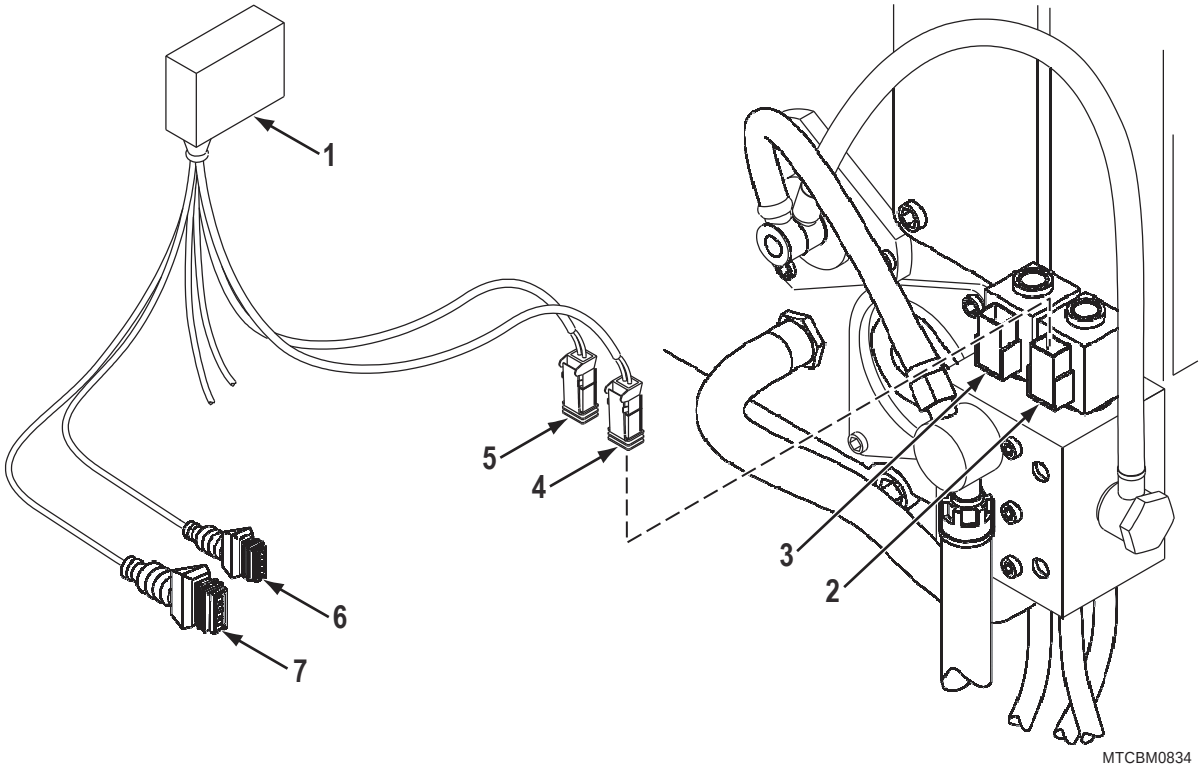


Figure 1. Engine Harness Removal.

END OF TASK

INSPECTION

1. Inspect engine harness for damaged insulation (WP 0087). Replace if damaged.
2. Inspect engine harness connectors for damage insulation (WP 0087). Replace if damaged.

END OF TASK

INSTALLATION

NOTE

Position harness as noted on removal. Remove tags on installation.

1. Position engine harness (Figure 1, Item 1) to engine and install connectors (Figure 1, Items 6 and 7) if previously disconnected.
2. Connect engine harness connectors (Figure 1, Items 4 and 5) to input/output solenoids (Figure 1, Items 2 and 3).
3. Install new cable ties to secure engine harness (Figure 1, Item 1) to engine.

END OF TASK

FOLLOW ON TASK

1. Connect engine harness to ECU (WP 0208).
2. Connect engine harness to phase sensor (WP 0207).
3. Connect engine harness to oil pressure sensor (WP 0206).
4. Connect engine harness to fuel injector sensor (WP 0205).
5. Connect engine harness to speed sensor (WP 0204).
6. Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL FILTER AND BASE REPLACEMENT (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Strap, Pipe (WP 0294, Table 1, Item 24)

Materials/Parts
Filter Element, Fluid

Materials/Parts (cont.)
(WP 0295, Table 1, Item 31)
Filter, Fluid (WP 0295, Table 1, Item 32)
Rag, Wiping (WP 0293, Table 1, Item 20)

Equipment Condition
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

- Drain plug on fuel filters can take only a limited amount of torque. Use two wrenches in combination for breaking plugs loose and for final tightening. Failure to comply may result in damage to, or destruction of, equipment or mission.
- Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Primary and secondary fuel filters and their mounting hardware are unique and must be reinstalled in their original location.

REMOVAL

1. Remove drain plug (Figure 1, Item 8) and flatwasher (Figure 1, Item 7) from primary filter (Figure 1, Item 9) or secondary filter (Figure 1, Item 6) and drain fuel into container.
2. Remove screw (Figure 1, Item 2) and washer (Figure 1, Item 1) from primary filter (Figure 1, Item 9) or screw (Figure 1, Item 3) and washer (Figure 1, Item 4) from secondary filter (Figure 1, Item 6).
3. Remove primary filter (Figure 1, Item 9) or secondary filter (Figure 1, Item 6) from filter head (Figure 1, Item 5). Discard filter (Figure 1, Item 6 or 9).

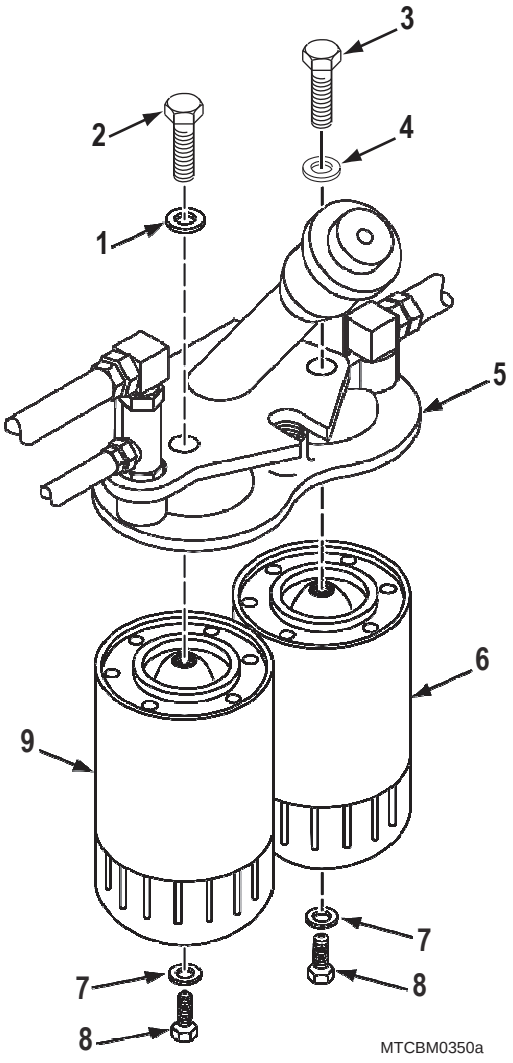


Figure 1. Fuel Filter Replacement.

END OF TASK

INSTALLATION

1. Install primary filter (Figure 1, Item 9) or secondary filter (Figure 1, Item 6) on filter head (Figure 1, Item 5).
2. Install screw (Figure 1, Item 2) and washer (Figure 1, Item 1) on primary filter (Figure 1, Item 9) or screw (Figure 1, Item 3) and washer (Figure 1, Item 4) on secondary filter (Figure 1, Item 6).
3. Torque screw (Figure 1, Item 2 or 3) until gasket on filter touches filter head (Figure 1, Item 5). Torque screw an additional 1-1/2 to 2 turns.
4. Install drain plug (Figure 1, Item 8) and flatwasher (Figure 1, Item 7) on primary filter (Figure 1, Item 9) or secondary filter (Figure 1, Item 6).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
LOMBARDINI FUEL FILTER ASSEMBLY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 155)
Rag, Wiping (WP 0293, Table 1, Item 20)

Materials/Parts (cont.)
Sealing Compound (WP 0293, Table 1, Item 22)
Washer, Lock (WP 0295, Table 1, Item 110)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL EARLY AND PRE-EPA FUEL FILTER ASSEMBLIES

NOTE

If you're just changing filter, perform Step 1.

1. Remove fuel filter (Figure 1, Item 4) from fuel filter housing (Figure 1, Item 1).
2. Remove two bolts (Figure 1, Item 3), lockwashers (Figure 1, Item 2), and fuel filter housing (Figure 1, Item 1) from engine. Discard lockwashers (Figure 1, Item 2).

END OF TASK

INSTALLATION EARLY AND PRE-EPA FUEL FILTER ASSEMBLIES

1. Install fuel filter housing (Figure 1, Item 1), two new lockwashers (Figure 1, Item 2), and bolts (Figure 1, Item 3) on engine.
2. Install fuel filter (Figure 1, Item 4) onto fuel filter housing (Figure 1, Item 1).

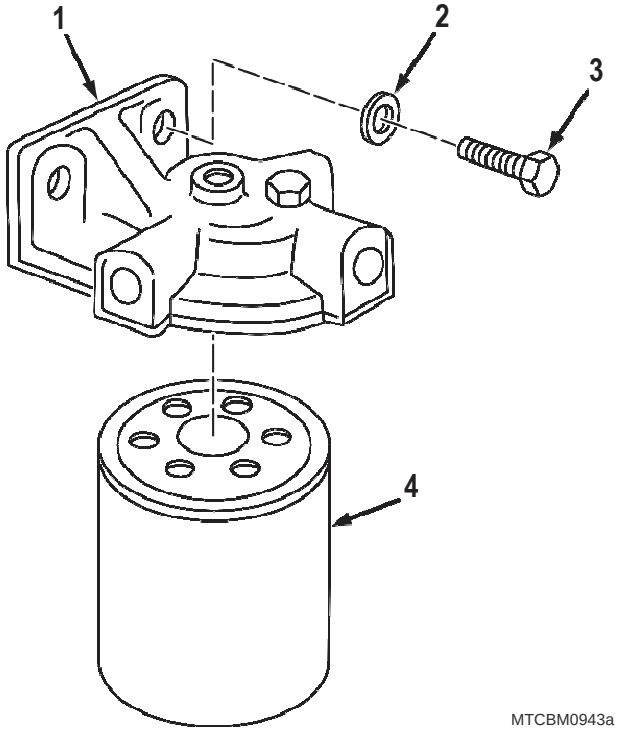


Figure 1. Fuel Filter Assembly Replacement (Early and Pre-EPA).

END OF TASK

REMOVAL EPA AND TIER II FUEL FILTER ASSEMBLIES

NOTE

If you're just changing filter, perform Step 1.

1. Remove fuel filter (Figure 2, Item 6) from fuel filter housing (Figure 2, Item 5).
2. Remove washer (Figure 2, Item 8), nut (Figure 2, Item 7), and housing (Figure 2, Item 5) from fuel filter housing bracket (Figure 2, Item 5).
3. Remove bolt (Figure 2, Item 4), washer (Figure 2, Item 2), and fuel filter housing bracket (Figure 2, Item 1) from engine.

END OF TASK

INSTALLATION EPA AND TIER II FUEL FILTER ASSEMBLIES

1. Install fuel filter housing bracket (Figure 2, Item 1), washer (Figure 2, Item 2), and bolt (Figure 2, Item 3) on engine.
2. Install housing (Figure 2, Item 5), nut (Figure 2, Item 7), and washer (Figure 2, Item 8) on fuel filter housing bracket (Figure 2, Item 1).
3. Install fuel filter (Figure 2, Item 6) on fuel filter housing (Figure 2, Item 5).

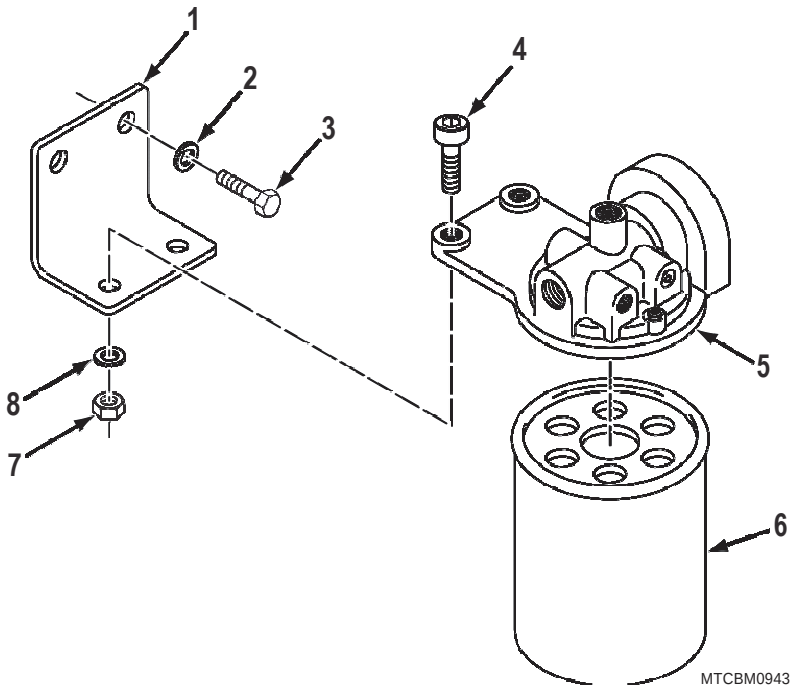


Figure 2. Fuel Filter Assembly Replacement (EPA and Tier II).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE THROTTLE MAINTENANCE (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

ENGINE THROTTLE CABLE REMOVAL

1. Remove nut (Figure 1, Item 12) and throttle cable (Figure 1, Item 1) from throttle cable lever (Figure 1, Item 11).
2. Remove two nuts (Figure 1, Item 2), bracket (Figure 1, Item 4), and throttle cable (Figure 1, Item 1) from intake manifold (Figure 1, Item 3).
3. Remove screw (Figure 1, Item 8) and handle (Figure 1, Item 7) from throttle cable (Figure 1, Item 1).
4. Remove packing nut (Figure 1, Item 6), jamnut (Figure 1, Item 9), and washer (Figure 1, Item 10) from throttle cable (Figure 1, Item 1).
5. Pull throttle cable (Figure 1, Item 1) through control panel (Figure 1, Item 5) and remove from trailer.

NOTE

Engine throttle cable must be removed.

6. Remove nut (Figure 1, Item 13) and throttle cable lever (Figure 1, Item 11) from engine.

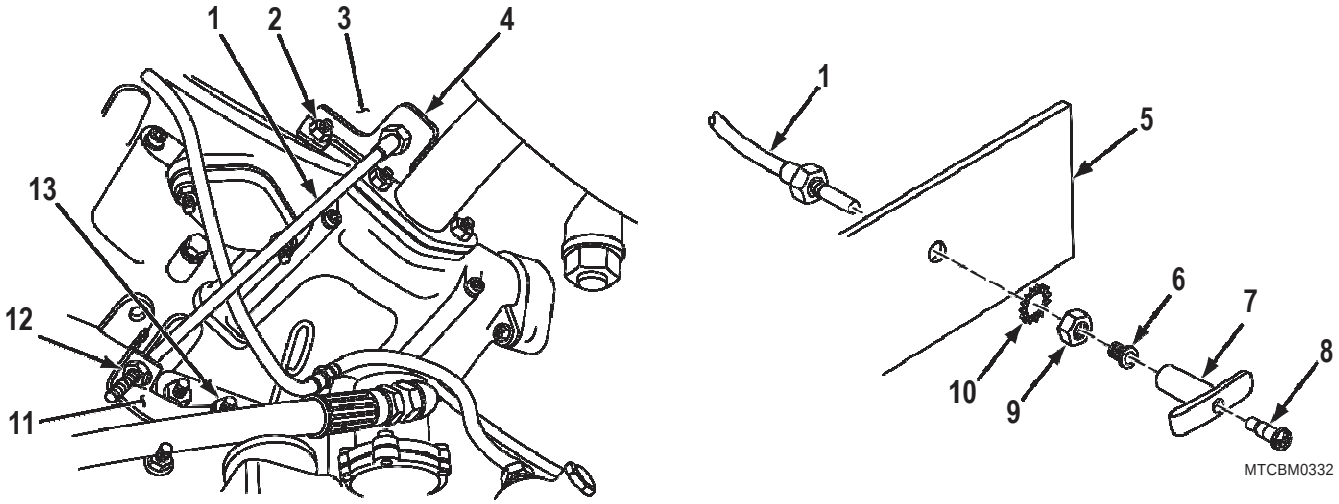


Figure 1. Throttle Cable Removal.

END OF TASK

ENGINE THROTTLE CABLE INSTALLATION

1. Install throttle cable lever (Figure 2, Item 11) and nut (Figure 2, Item 13) on engine.
2. Insert throttle cable (Figure 2, Item 1) through control panel (Figure 2, Item 5) and install with washer (Figure 2, Item 10), jamnut (Figure 2, Item 9), packing nut (Figure 2, Item 6), throttle cable handle (Figure 2, Item 7), and screw (Figure 2, Item 8).
3. Route throttle cable (Figure 2, Item 1) to engine and install on throttle cable lever (Figure 2, Item 11) with nut (Figure 2, Item 12). Do not tighten nut (Figure 2, Item 12).
4. Install bracket (Figure 2, Item 4) and throttle cable (Figure 2, Item 1) on intake manifold (Figure 2, Item 3) with two nuts (Figure 2, Item 2).
5. Adjust throttle cable (Figure 2, Item 1):
   a. Release and pull throttle cable handle (Figure 2, Item 7) to full open position.
   b. Rotate throttle cable lever (Figure 2, Item 11) to full throttle position.
   c. While holding throttle cable lever (Figure 2, Item 11), adjust and tighten jamnut (Figure 2, Item 9) on throttle cable (Figure 2, Item 1).

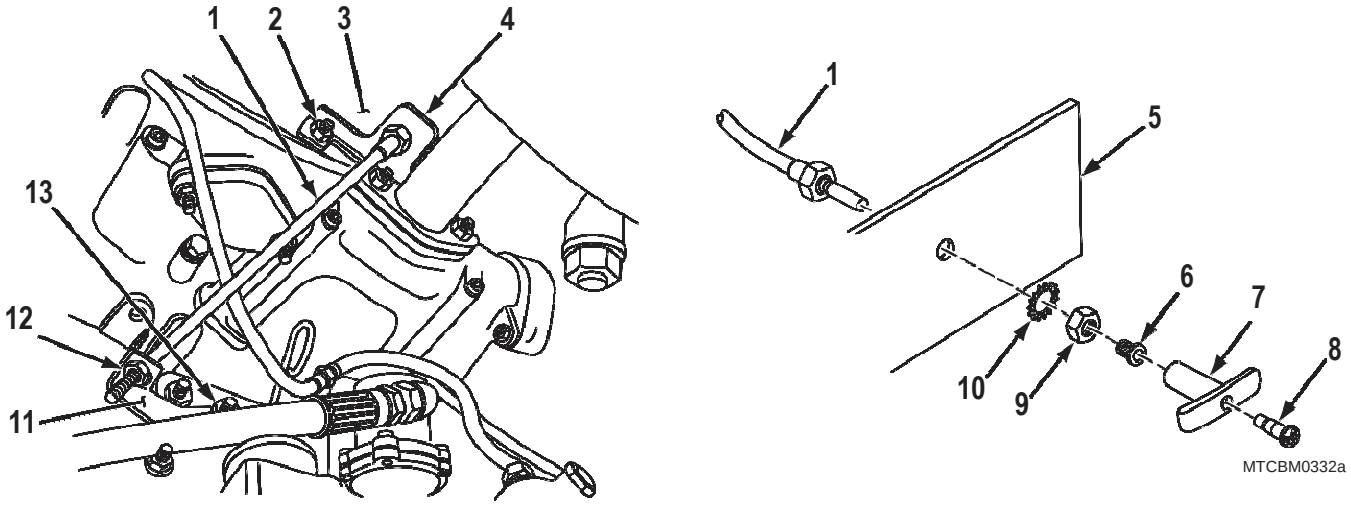


Figure 2. Throttle Cable Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
MUFFLER AND EXHAUST PIPE REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 13)
Nuts, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 161)
Washer, Lock
Qty: (2) (WP 0295, Table 1, Item 182)
Washer, Lock
Qty: (2) (WP 0295, Table 1, Item 196)

Materials/Parts (cont.)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

NOTE

The muffler and exhaust pipe are replaced the same way on trailers equipped with Onan or Lombardini engines.

1. Remove two screws (Figure 1, Item 1), washers (Figure 1, Item 2), and self-locking nuts (Figure 1, Item 3) from muffler shroud (Figure 1, Item 4). Discard self-locking nuts (Figure 1, Item 3).
2. Remove eight screws (Figure 1, Item 5), washers (Figure 1, Item 6), and muffler shroud (Figure 1, Item 4) from semitrailer.

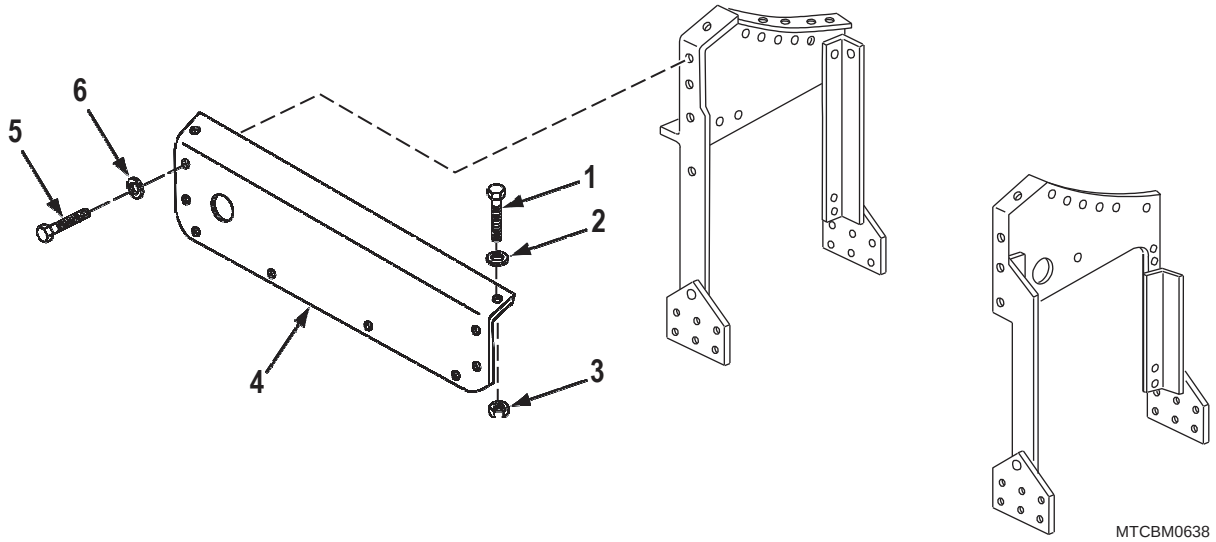


Figure 1. Muffler Shroud Removal.

REMOVAL - Continued

3. Remove two screws (Figure 2, Item 6), lockwashers (Figure 2, Item 3), nuts (Figure 2, Item 4), and loop clamp (Figure 2, Item 5) from muffler (Figure 2, Item 2) and exhaust pipe (Figure 2, Item 7). Discard lockwashers (Figure 2, Item 3).

NOTE

If the semitrailer is equipped with muffler clamps (Figure 2, Item 1), remove per Step 4 and 5. If the semitrailer is equipped with two muffler clamps (Figure 2, Item 14), perform Step 6.

4. Remove two muffler clamps (Figure 2, Item 1) from muffler (Figure 2, Item 2) and mounting plate (Figure 2, Item 8).
5. Remove muffler (Figure 2, Item 2) from exhaust pipe (Figure 2, Item 7) and mounting plate (Figure 2, Item 8).
6. Remove two muffler clamps (Figure 2, Item 14) and muffler (Figure 2, Item 2) from exhaust pipe (Figure 2, Item 7) and mounting plate (Figure 2, Item 8).
7. Remove two screws (Figure 2, Item 12), lockwashers (Figure 2, Item 11), exhaust pipe (Figure 2, Item 13), and gasket (Figure 2, Item 10) from manifold (Figure 2, Item 9). Discard gasket (Figure 2, Item 10) and lockwashers (Figure 2, Item 11).

END OF TASK

INSTALLATION

1. Install exhaust pipe (Figure 2, Item 13) and new gasket (Figure 2, Item 10) on manifold (Figure 2, Item 9) with two screws (Figure 2, Item 12) and new lockwashers (Figure 2, Item 11).

NOTE

If the semitrailer was equipped with muffler clamps (Figure 2, Item 1), replace with muffler clamps (Figure 2, Item 4).

2. Install muffler (Figure 2, Item 2) on exhaust pipe (Figure 2, Item 7) and mounting plate (Figure 2, Item 8) with two muffler clamps (Figure 2, Item 14).
3. Install muffler (Figure 2, Item 2) on exhaust pipe (Figure 2, Item 7) and mounting plate (Figure 2, Item 8).
4. Install two muffler clamps (Figure 2, Item 1) on muffler (Figure 2, Item 2) and mounting plate (Figure 2, Item 8).
5. Install loop clamp (Figure 2, Item 5) on muffler (Figure 2, Item 2) and exhaust pipe (Figure 2, Item 7) with two screws (Figure 2, Item 6), nuts (Figure 2, Item 4), and new lockwashers (Figure 2, Item 3).

INSTALLATION - Continued

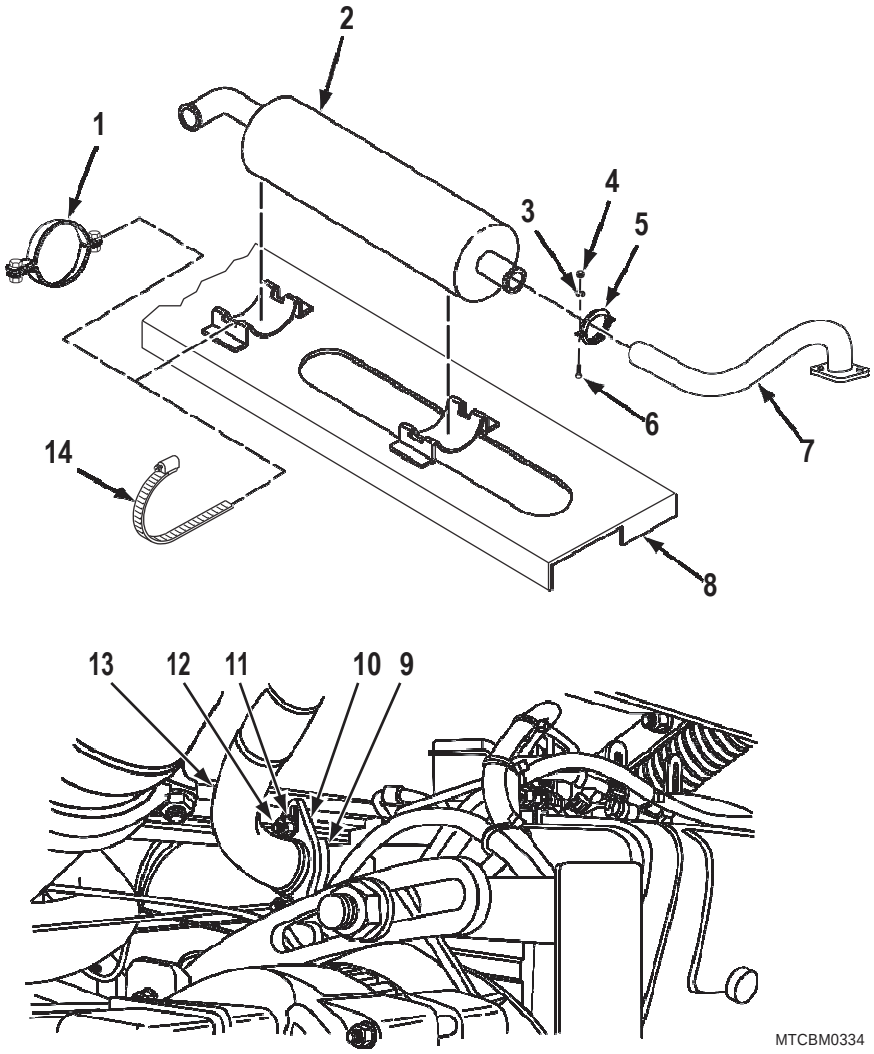


Figure 2. Muffler and Exhaust Pipe Replacement.

INSTALLATION - Continued

6. Position muffler shroud (Figure 3, Item 4) in place on semitrailer and secure with eight screws (Figure 3, Item 5) and washers (Figure 3, Item 6).
7. Install two screws (Figure 3, Item 1), washers (Figure 3, Item 2), and new self-locking nuts (Figure 3, Item 3) on muffler shroud (Figure 3, Item 4).

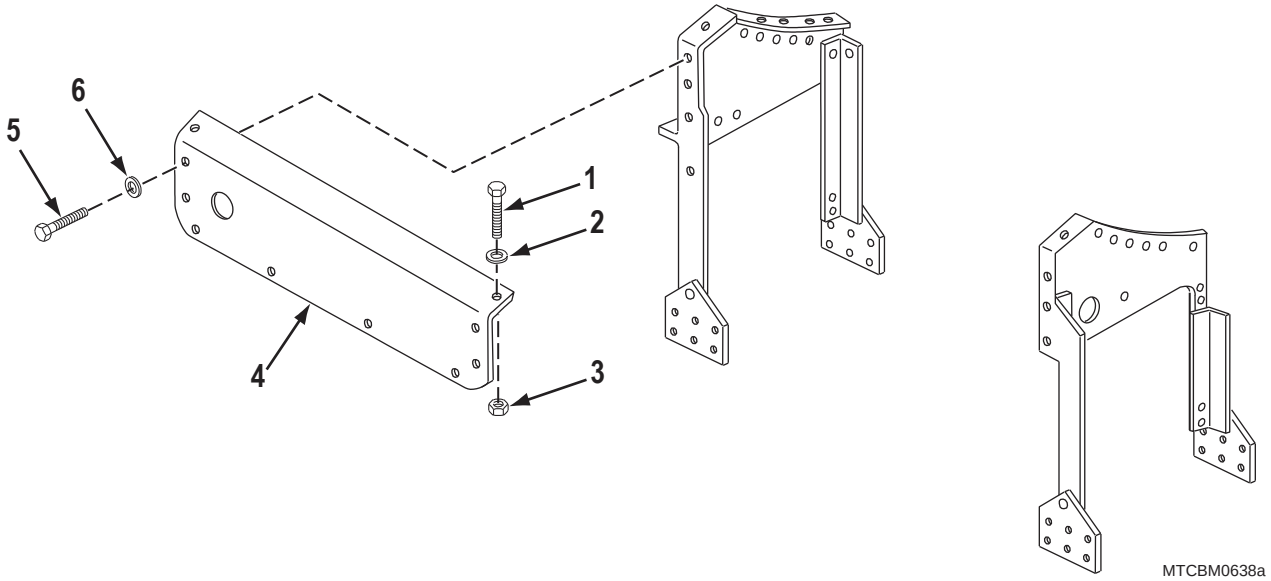


Figure 3. Muffler Shroud Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE EXHAUST MANIFOLD REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 27)

Materials/Parts
Gasket (WP 0295, Table 1, Item 79)
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (15) (WP 0295, Table 1, Item 173)
Washer, Lock
Qty: (6) (WP 0295, Table 1, Item 110)

Equipment Condition
Curbside hose trough cover removed (WP 0145)
Muffler and exhaust pipe removed (WP 0213)
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Remove 10 self-locking nuts (Figure 1, Item 4), screws (Figure 1, Item 1), 20 washers (Figure 1, Item 2), and shroud (Figure 1, Item 3) from two support brackets (Figure 1, Item 5). Discard self-locking nuts (Figure 1, Item 4).

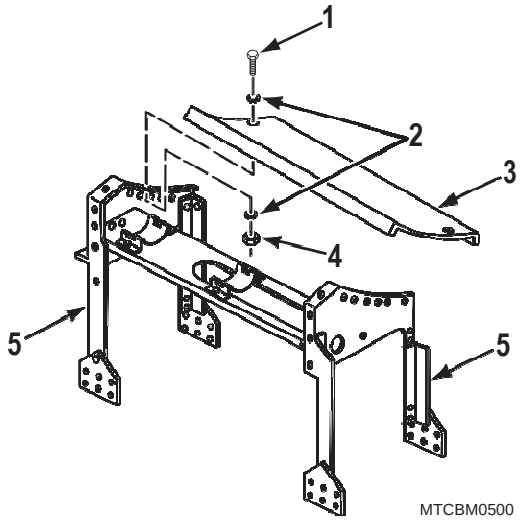


Figure 1. Engine Exhaust Manifold Removal.

REMOVAL - Continued

2. Remove five self-locking nuts (Figure 2, Item 12), washers (Figure 2, Item 13), screws (Figure 2, Item 15), and muffler tray (Figure 2, Item 11) from two support brackets (Figure 2, Item 10). Discard self-locking nuts (Figure 2, Item 12).
3. Remove six nuts (Figure 2, Item 2), lockwashers (Figure 2, Item 3), exhaust manifold (Figure 2, Item 9), and three gaskets (Figure 2, Item 1) from engine. Discard lockwashers (Figure 2, Item 3) and gaskets (Figure 2, Item 1).

NOTE

Perform Step 4 if replacing with new exhaust manifold.

4. Remove two studs (Figure 2, Item 4), lockwashers (Figure 2, Item 7), nuts (Figure 2, Item 8), spacer plate (Figure 2, Item 6), and gasket (Figure 2, Item 5) from exhaust manifold (Figure 2, Item 9). Discard lockwashers (Figure 2, Item 7) and gasket (Figure 2, Item 5).

END OF TASK

INSTALLATION

NOTE

Perform Step 1 if installing new exhaust manifold.

1. Install new gasket (Figure 2, Item 5) and spacer plate (Figure 2, Item 6) on exhaust manifold (Figure 2, Item 9) with new lockwasher (Figure 2, Item 7), nut (Figure 2, Item 8), and two studs (Figure 2, Item 4).
2. Position three new gaskets (Figure 2, Item 1) and exhaust manifold (Figure 2, Item 9) on engine and install with six new lockwashers (Figure 2, Item 3) and nuts (Figure 2, Item 2). Torque nuts to 168 lb in. (19 N·m).
3. Install muffler tray (Figure 2, Item 11) on support brackets (Figure 2, Item 10) with five screws (Figure 2, Item 15), washers (Figure 2, Item 13), and new self-locking nuts (Figure 2, Item 12).
4. Install shroud (Figure 2, Item 18) on two support brackets (Figure 2, Item 10) with 20 washers (Figure 2, Item 16), 10 screws (Figure 2, Item 17), and new self-locking nuts (Figure 2, Item 14).

INSTALLATION - Continued

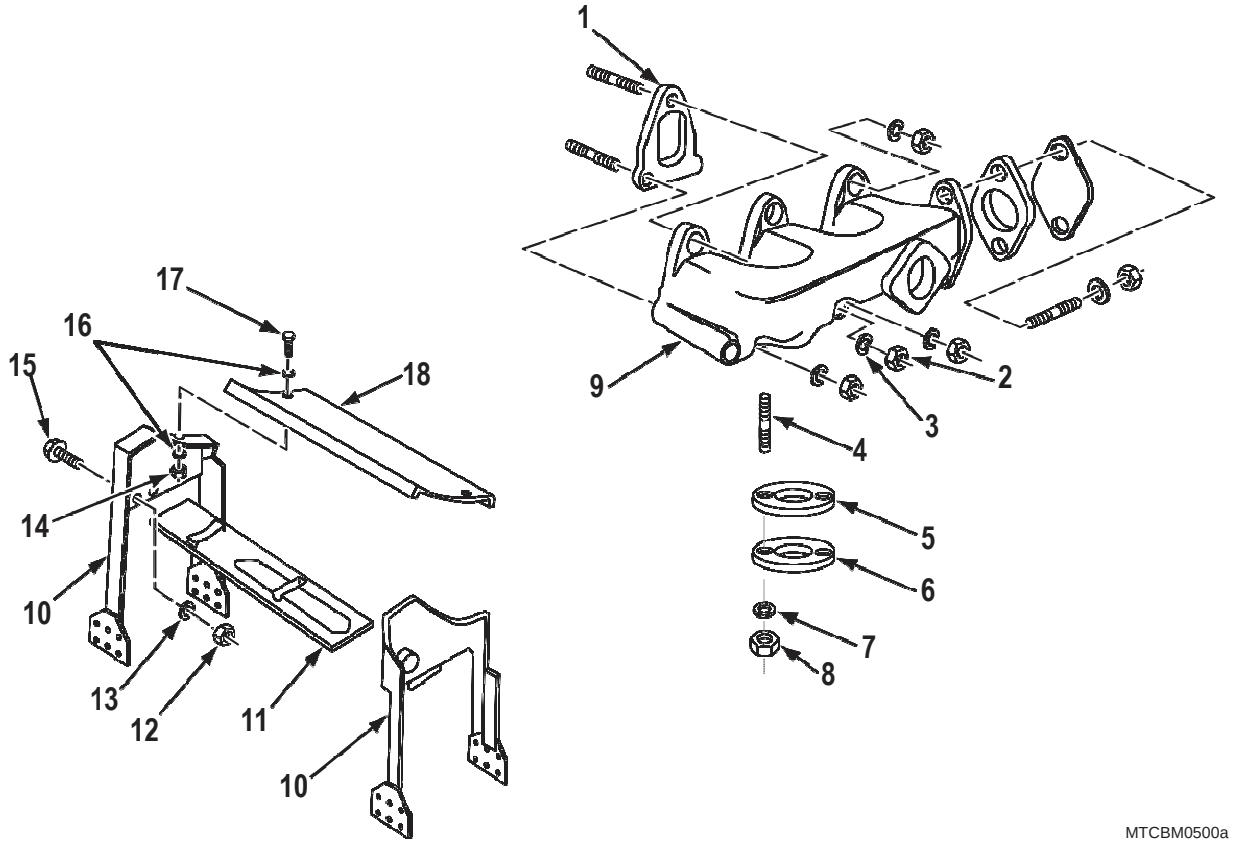


Figure 2. Engine Exhaust Manifold Replacement.

END OF TASK

FOLLOW ON TASK

1. Install muffler and exhaust pipe (WP 0213).
2. Install curbside hose trough cover (WP 0145).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE SHROUDING REPLACEMENT (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 162)
Nut, Self-Locking
Qty: (5) (WP 0295, Table 1, Item 166)

Equipment Condition
Air cleaner hose disconnected at intake manifold
(WP 0200) (WP 0197)

Equipment Condition (cont.)
Engine fuel lines disconnected
(if removing bottom cylinder pan) (WP 0202)
Engine high-temp thermostatic
control switch removed (WP 0221)
Engine throttle and choke linkage removed
Fuel lines removed from fuel tank
(if removing blower housing) (WP 0202)
Governor linkage assembly removed
(if removing bottom cylinder pan)
Muffler and exhaust pipe removed (WP 0213)
Semitrailer uncoupled (WP 0007)
Throttle cable at engine removed
(if removing rear cylinder housing)

ENGINE SHROUDING REMOVAL

1. Remove five screws (Figure 1, Item 6), washers (Figure 1, Item 5), self-locking nuts (Figure 1, Item 4), and muffler tray (Figure 1, Item 2) from two supports (Figure 1, Items 1 and 3). Discard self-locking nuts (Figure 1, Item 4).

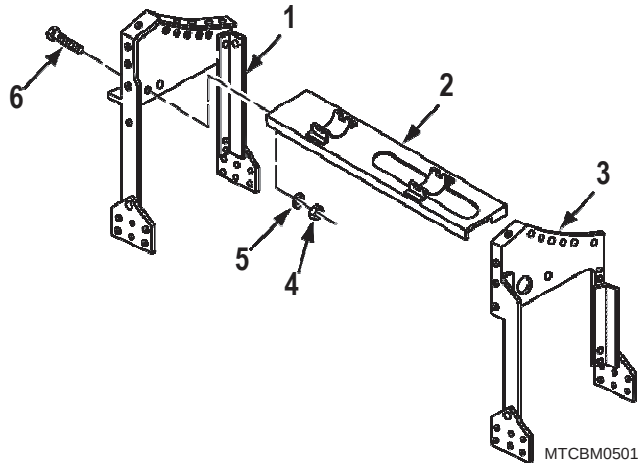


Figure 1. Muffler Tray Removal.

ENGINE SHROUDING REMOVAL - Continued

2. Remove four screws (Figure 2, Item 3), washers (Figure 2, Item 5), self-locking nuts (Figure 2, Item 4), and engine fan shroud (Figure 2, Item 2) from frame (Figure 2, Item 6) and support (Figure 2, Item 1). Discard self-locking nuts (Figure 2, Item 4).

END OF TASK

ENGINE SHROUD INSTALLATION

1. Install engine fan shroud (Figure 2, Item 2) on frame (Figure 2, Item 6) and support (Figure 2, Item 1) with four screws (Figure 2, Item 3), washers (Figure 2, Item 5), and new self-locking nuts (Figure 2, Item 4).

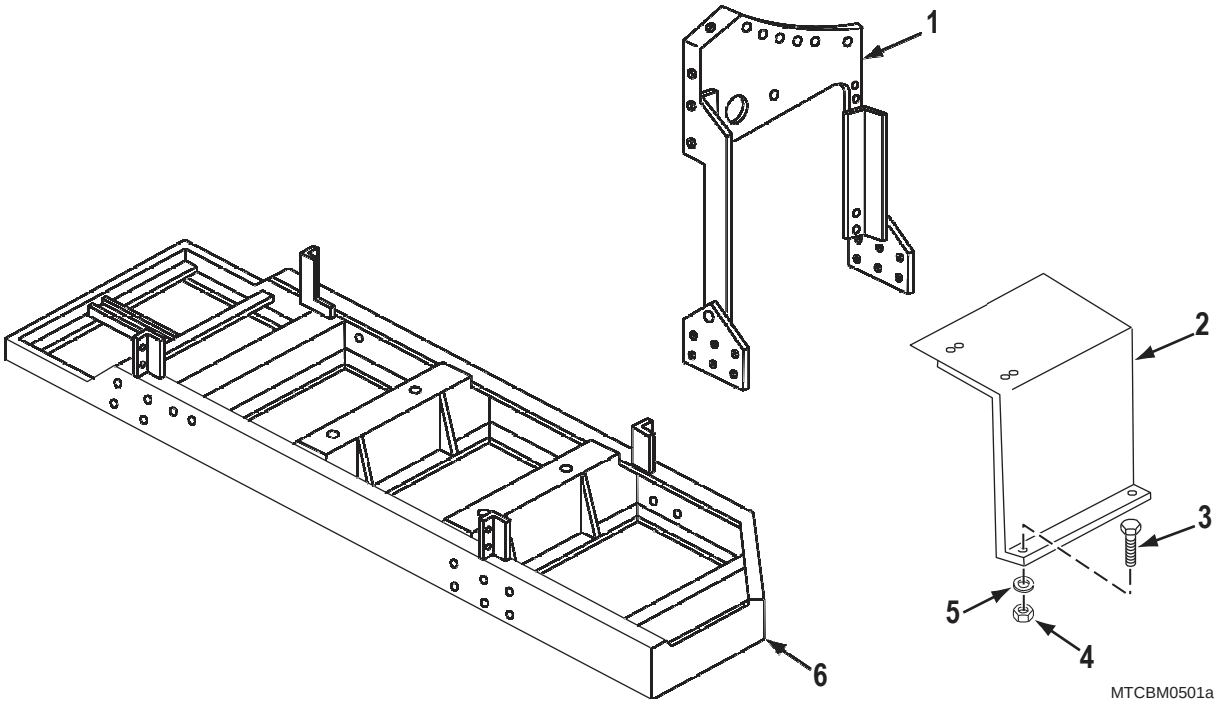


Figure 2. Blower Housing Removal.

2. Install muffler tray (Figure 3, Item 3) on two supports (Figure 3, Items 1 and 2) with five screws (Figure 3, Item 6), washers (Figure 3, Item 5), and new self-locking nuts (Figure 3, Item 4).

ENGINE SHROUD INSTALLATION - Continued

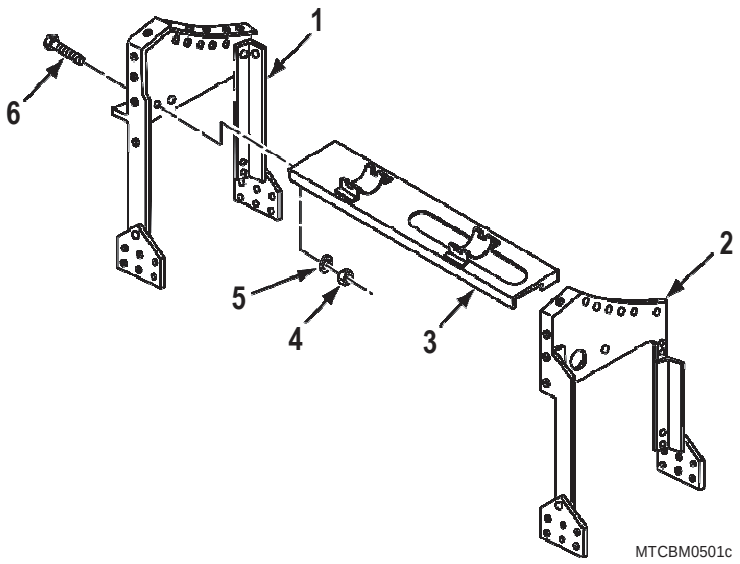


Figure 3. Muffler Tray Installation.

END OF TASK

FOLLOW ON TASK

1. Install muffler and exhaust pipe (WP 0213).
2. Connect air cleaner hose at intake manifold (WP 0200).
3. Install fuel lines on fuel tank (if installing blower housing) (WP 0202).
4. Install throttle cable at engine (if installing rear cylinder housing) (WP 0202).
5. Install governor linkage assembly (if installing bottom cylinder pan).
6. Connect engine fuel lines (if installing bottom cylinder pan) (WP 0202) .
7. Install engine high-temp thermostatic control switch (WP 0221).
8. Install engine throttle and choke linkage.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE SHROUD REPLACEMENT (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Engine removed (WP 0176)

Equipment Condition (cont.)
Fuel injection line removed (WP 0189)
Fuel injection return line removed
(WP 0189)
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Remove two pivot screws (Figure 1, Item 12) and pan (Figure 1, Item 1) from shroud (Figure 1, Item 2).
2. Remove two screws (Figure 1, Item 11), washers (Figure 1, Item 10) and shroud (Figure 1, Item 2) from engine.
3. Remove screw (Figure 1, Item 7), washer (Figure 1, Item 8) and front shroud (Figure 1, Item 9) from engine.
4. Remove two screws (Figure 1, Item 6) from rear shroud (Figure 1, Item 5) and engine.
5. Remove two screws (Figure 1, Item 3), washers (Figure 1, Item 4), and rear shroud (Figure 1, Item 5) from engine.

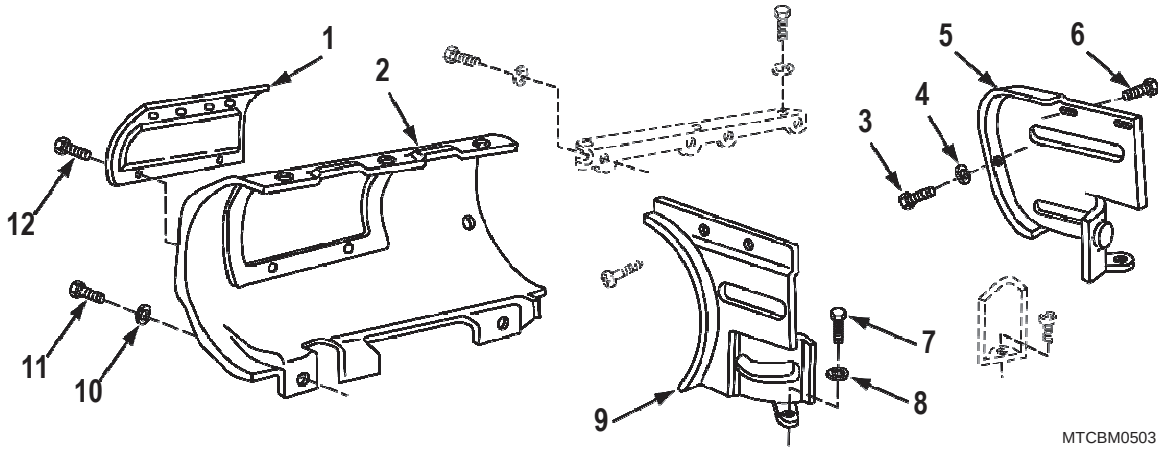


Figure 1. Engine Shroud Removal.

END OF TASK

INSTALLATION

1. Install rear shroud (Figure 2, Item 5) on engine with two washers (Figure 2, Item 4), screws (Figure 2, Item 3), and screws (Figure 2, Item 6).
2. Position front shroud (Figure 2, Item 9) on engine with washer (Figure 2, Item 8), and screw (Figure 2, Item 7).
3. Position shroud (Figure 2, Item 2) on engine with two washers (Figure 2, Item 10) and screws (Figure 2, Item 11).
4. Install pan (Figure 2, Item 1) on shroud (Figure 2, Item 2) with two pivot screws (Figure 2, Item 12).

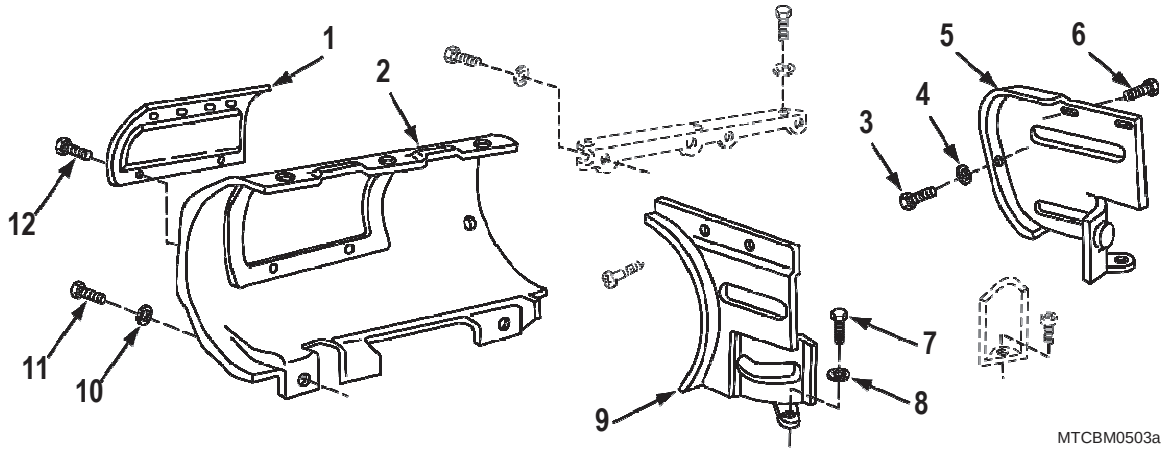


Figure 2. Engine Shroud Installation.

END OF TASK

FOLLOW ON TASK

1. Install injection line (WP 0189).
2. Install injection return line (WP 0189).
3. Install engine (WP 0176).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ALTERNATOR AND MOUNTING BRACKET MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking (WP 0295, Table 1, Item 112)
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 165)
Washer, Lock

Materials/Parts (cont.)
Qty: (2) (WP 0295, Table 1, Item 111)

Equipment Condition
Negative battery cables disconnected (WP 0098)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

- When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative and positive battery cables from batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Alternator weighs approximately 25 lbs (11.3 kg) Use care when replacing alternator to avoid injury to personnel or damage to equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

REMOVAL

1. Remove pipe plug (Figure 1, Item 1) from intermediate housing (Figure 1, Item 2).

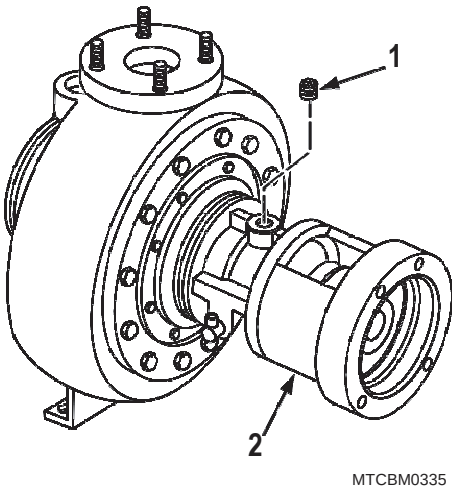


Figure 1. Pipe Plug Removal.

2. Remove screw (Figure 2, Item 7), two washers (Figure 2, Item 2), and self-locking nut (Figure 2, Item 1) from alternator (Figure 2, Item 12), adjusting arm (Figure 2, Item 3), and guard (Figure 2, Item 9). Discard self-locking nut (Figure 2, Item 1).
3. Remove screw (Figure 2, Item 7), two washers (Figure 2, Item 2), self-locking nut (Figure 2, Item 1), and adjusting arm (Figure 2, Item 3) from bracket (Figure 2, Item 6). Discard self-locking nut (Figure 2, Item 1).
4. Remove two screws (Figure 2, Item 4), washer (Figure 2, Item 5), and bracket (Figure 2, Item 6) from engine.
5. Loosen two screws (Figure 2, Item 10) and pull alternator (Figure 2, Item 12) down to release tension on alternator V-belt (Figure 2, Item 11). Remove V-belt (Figure 2, Item 11) from pulley (Figure 2, Item 8).

REMOVAL - Continued

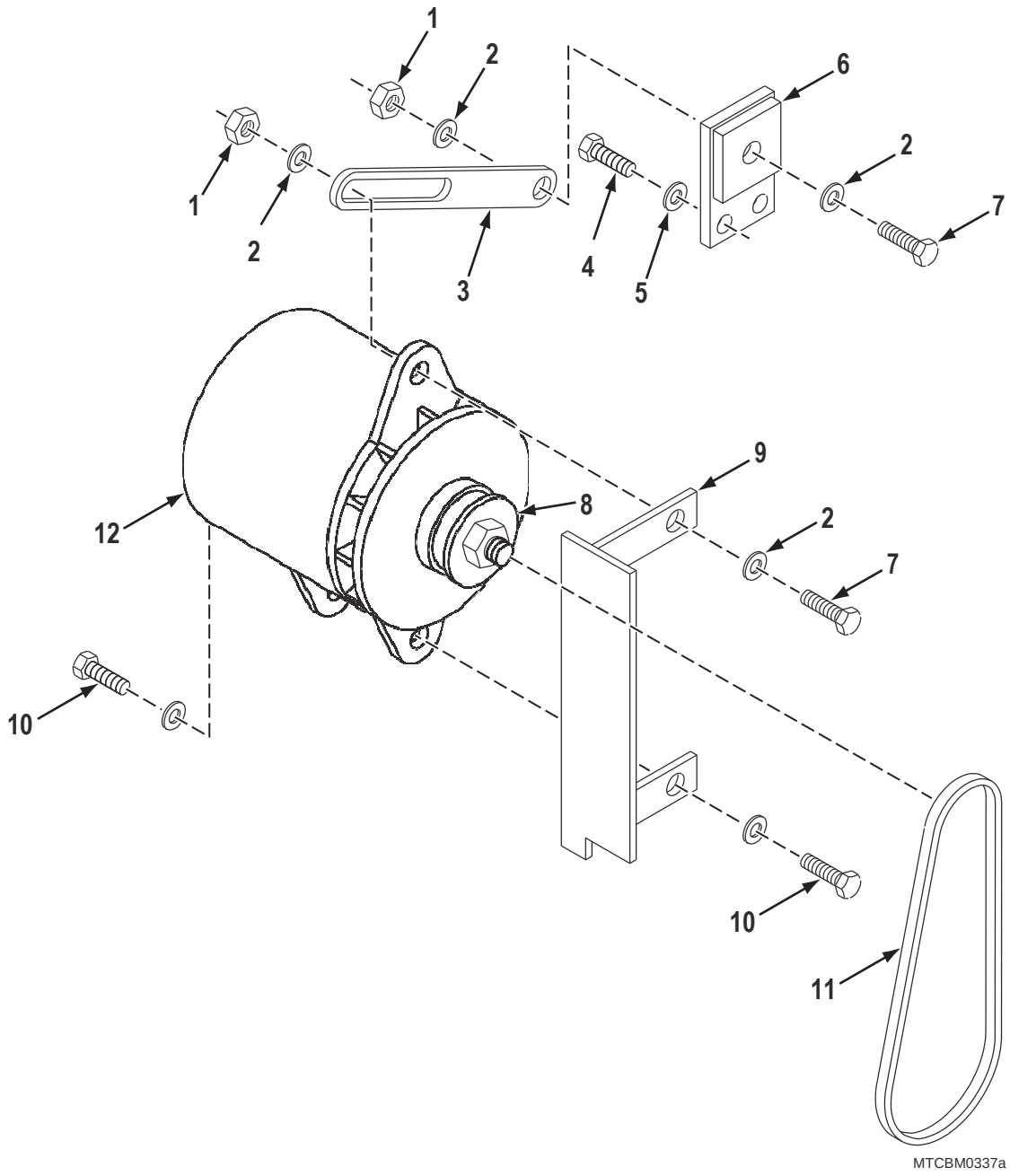


Figure 2. Alternator Removal.

REMOVAL - Continued

6. Remove two nuts (Figure 3, Item 2), lockwashers (Figure 3, Item 3), and positive and negative cables (Figure 3, Items 1 and 5) from alternator (Figure 3, Item 4). Discard lockwashers (Figure 3, Item 3).

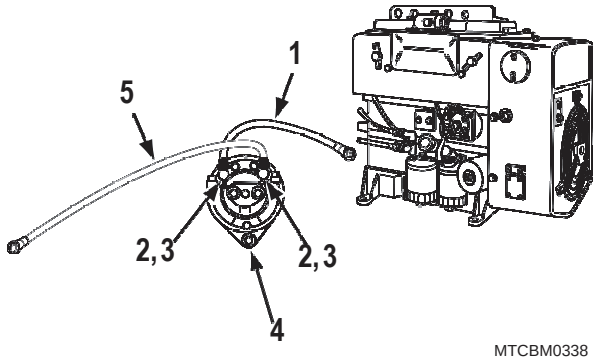


Figure 3. Alternator Cable Removal.

7. Remove self-locking nut (Figure 4, Item 12), pulley (Figure 4, Item 11), and woodruff key (Figure 4, Item 8) from alternator (Figure 4, Item 19).
8. Remove two screws (Figure 4, Item 14), self-locking nuts (Figure 4, Item 18), four washers (Figure 4, Item 2), alternator (Figure 4, Item 19), and guard (Figure 4, Item 9) from mounting bracket (Figure 4, Item 15). Discard self-locking nuts (Figure 4, Item 18).
9. Remove three screws (Figure 4, Item 17), washers (Figure 4, Item 16), and mounting bracket (Figure 4, Item 15) from engine.

END OF TASK

INSTALLATION

1. Install woodruff key (Figure 4, Item 8) and pulley (Figure 4, Item 11) on alternator (Figure 4, Item 19) and secure with self-locking nut (Figure 4, Item 12).
2. Install mounting bracket (Figure 4, Item 15) on engine with two screws (Figure 4, Items 14 and 17) and washers (Figure 4, Items 2 and 16).
3. Install bracket (Figure 4, Item 9) on engine with screw (Figure 4, Item 14) and washer (Figure 4, Item 2).
4. Install adjusting arm (Figure 4, Item 3) on bracket (Figure 4, Item 9) with screw (Figure 4, Item 10), two washers (Figure 4, Item 2), and self-locking nuts (Figure 4, Item 1).
5. Install alternator V-belt (Figure 4, Item 13) on pulley (Figure 4, Item 11).
6. Attach alternator (Figure 4, Item 19) to adjusting arm (Figure 4, Item 3) with screw (Figure 4, Item 7), washers (Figure 4, Item 2), and new self-locking nut (Figure 4, Item 1). Raise alternator (Figure 4, Item 19) to put tension on V-belt (Figure 4, Item 13), then snug, but do not torque screw (Figure 4, Item 7).
7. Install bracket (Figure 4, Item 15) on engine with two screws (Figure 4, Items 14 and 17) and washers (Figure 4, Items 2 and 16).

INSTALLATION - Continued

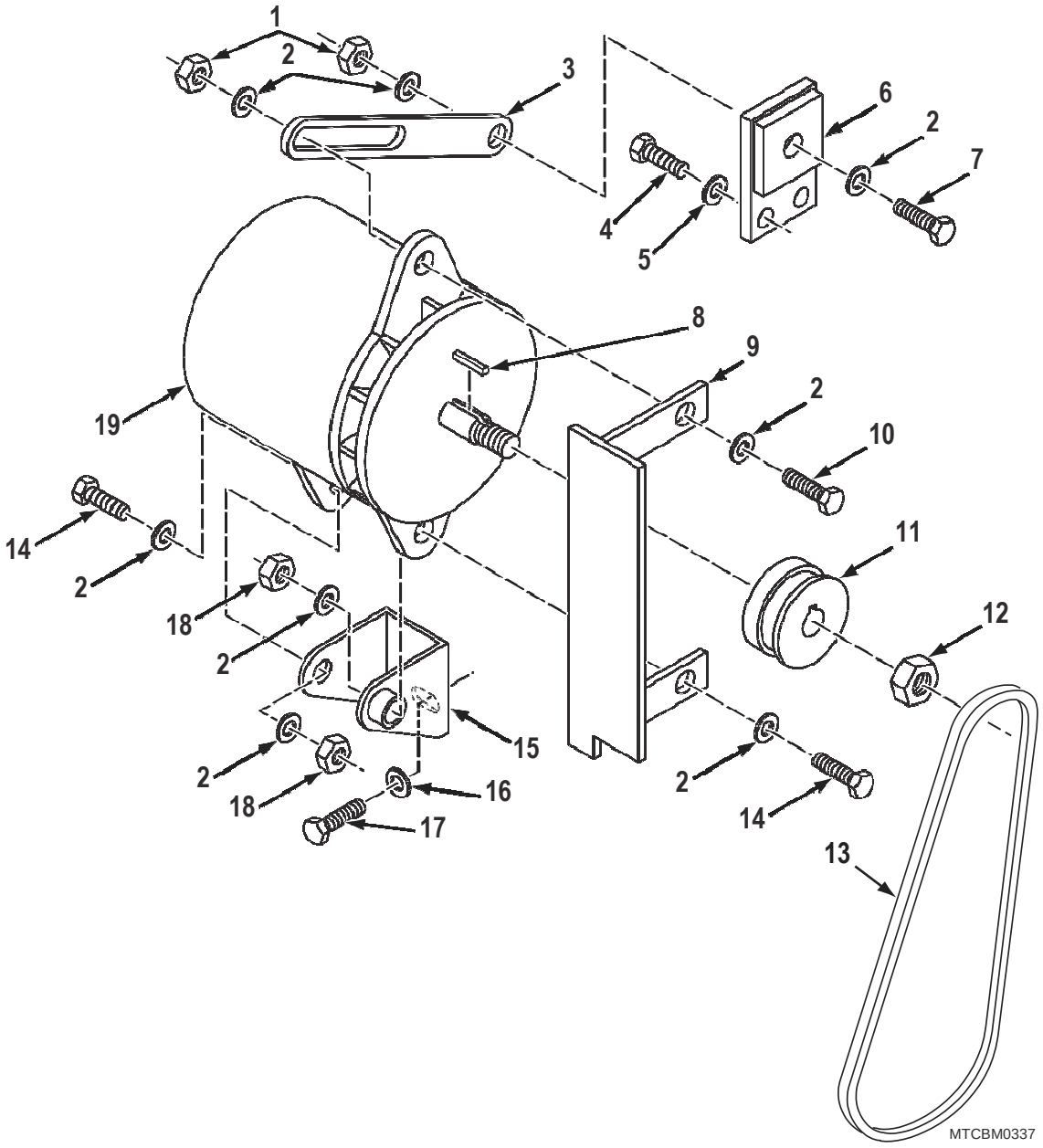


Figure 4. Alternator Removal.

INSTALLATION - Continued

8. Install pipe plug (Figure 5, Item 1) in intermediate housing (Figure 5, Item 2).

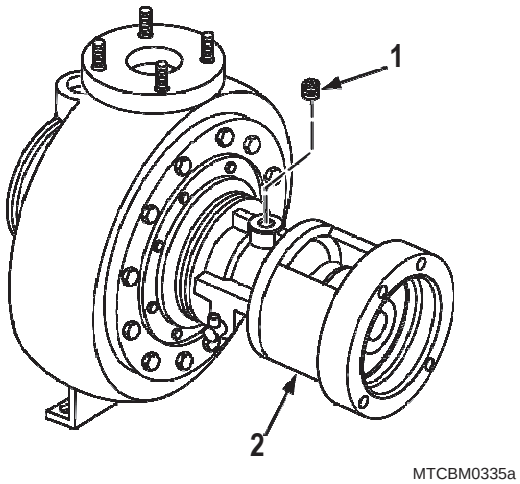


Figure 5. Pipe Plug Installation.

END OF TASK

ADJUSTMENT

1. Loosen three screws (Figure 6, Item 3) which hold alternator (Figure 6, Item 1) in place.

NOTE

Proper V-belt tension is 1/8 in. (0.318 cm) to 1/4 in. (0.635 cm) deflection of belt midway between the pulleys.

2. Raise alternator (Figure 6, Item 1) to obtain proper tension on V-belt (Figure 6, Item 2).
3. Tighten screws (Figure 6, Item 3) to secure alternator (Figure 6, Item 1) in place.

ADJUSTMENT - Continued

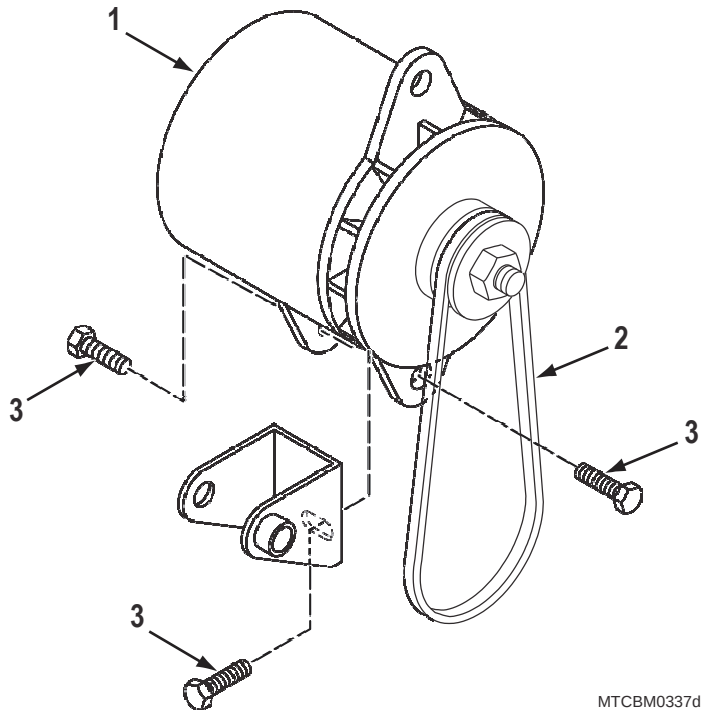


Figure 6. Alternator Adjustment

END OF TASK

FOLLOW ON TASK

1. Disconnect ground (WP 0008).
2. Connect positive and negative battery cables (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ALTERNATOR DRIVE BELT MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 27)

Materials/Parts
Sealing Compound

Materials/Parts (cont.)
(WP 0293, Table 1, Item 13)
Washer, Lock
Qty: (8) (WP 0295, Table 1, Item 182)

Equipment Condition
Alternator removed (WP 0217)

REMOVAL

NOTE

It may be necessary to rotate crankshaft to access mounting screws securing flex plate to alternator drive belt pulley. Trailers equipped with Lombardini engine are turned using crankshaft pulley bolt.

1. Remove eight screws (Figure 1, Item 5) and lockwashers (Figure 1, Item 6) from coupling (Figure 1, Item 7) and flywheel (Figure 1, Item 8). Discard lockwashers (Figure 1, Item 6).
2. Locate two threaded holes in rubber element (Figure 1, Item 2) 180 degrees from each other. Insert two screws, previously removed, and torque until drive ring (Figure 1, Item 1) separates from rubber element (Figure 1, Item 2).
3. Pull rubber element (Figure 1, Item 2) from drive ring (Figure 1, Item 1).
4. Maneuver drive belt (Figure 1, Item 3) through drive ring (Figure 1, Item 1) and over rubber element (Figure 1, Item 2).
5. Using two pry bars (Figure 1, Item 4), pry rubber element (Figure 1, Item 2) from flywheel (Figure 1, Item 8) and remove drive belt (Figure 1, Item 3) from vehicle.

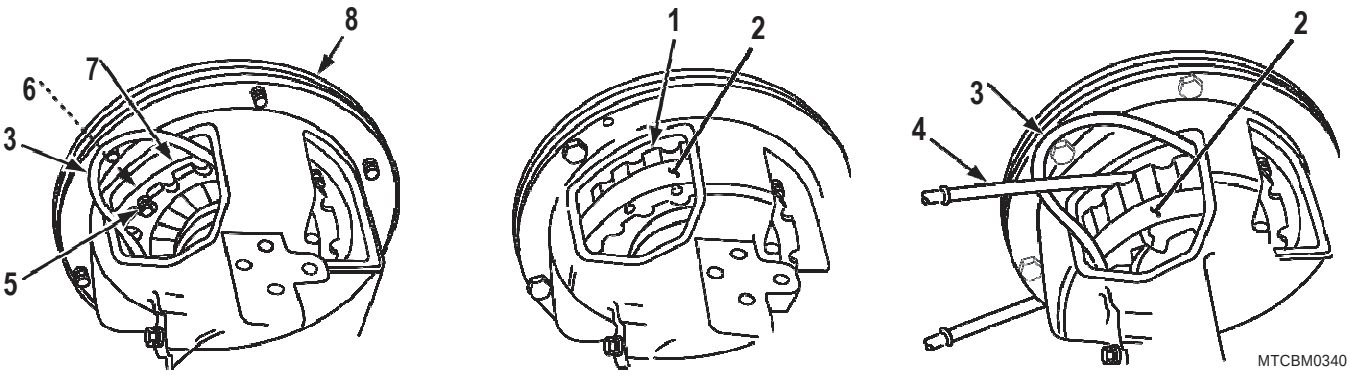


Figure 1. Alternator Drive Belt Removal.

END OF TASK

INSTALLATION

NOTE

Do not fully torque drive ring mounting screws at this time. Screws act as guides for installing drive ring.

1. Compress drive belt (Figure 2, Item 3) and insert between rubber element (Figure 2, Item 2) and flywheel (Figure 2, Item 8).
2. Using two pry bars (Figure 2, Item 4), pry rubber element (Figure 2, Item 2) from flywheel (Figure 2, Item 8) and maneuver drive belt (Figure 2, Item 3) down and around rubber element (Figure 2, Item 2).
3. Align holes of drive ring (Figure 2, Item 1) with mounting holes of flywheel (Figure 2, Item 8) and install eight washers (Figure 2, Item 6) and screws (Figure 2, Item 5) on coupling (Figure 2, Item 7). Finger tighten screws (Figure 2, Item 5).
4. Position drive belt (Figure 2, Item 3) on pulley.
5. Slide drive ring (Figure 2, Item 1) on rubber element (Figure 2, Item 2). Alternately torque screws (Figure 2, Item 5) 126 lb in. (14.2 N·m).

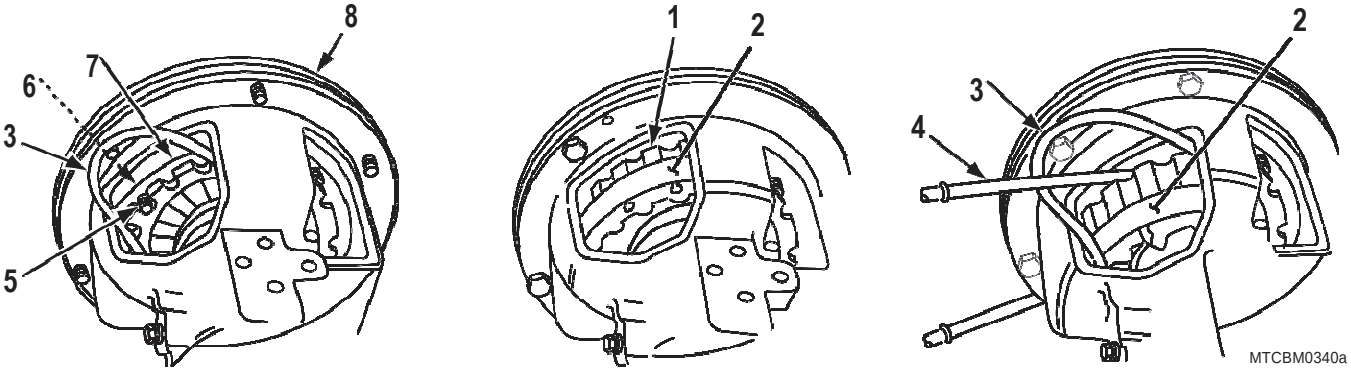


Figure 2. Alternator Drive Belt Installation.

END OF TASK

FOLLOW ON TASK

Install alternator (WP 0217).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE STARTER AND SOLENOID MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Materials/Parts
Rag, Wiping (WP 0293, Table 1, Item 20)
Solvent, Cleaning Compound

Materials/Parts (cont.)
(WP 0293, Table 1, Item 25)
Washer, Lock
Qty: (12) (WP 0295, Table 1, Item 195)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)
Negative battery cables disconnected WP 0098

VOLTAGE TEST (ON EQUIPMENT)

NOTE

Perform voltage test procedure for trailers equipped with Onan engine.

1. Make sure batteries are fully charged and that all battery and starter cables are serviceable and properly installed.
2. Turn engine switch to RUN.
3. To perform Test A, connect voltmeter (Figure 1, Item 5) positive lead (Figure 1, Item 4) to solenoid (Figure 1, Item 3). Connect voltmeter, negative lead (Figure 1, Item 6) to starter (Figure 1, Item 1). Turn starter switch to START. A voltage reading 12 V dc indicates circuits leading to starter are okay.
4. To perform Test B, connect voltmeter (Figure 1, Item 5) positive lead (Figure 1, Item 2) to solenoid (Figure 1, Item 3). Connect voltmeter, negative lead (Figure 1, Item 6) to starter (Figure 1, Item 1). Turn starter switch to START. If no voltage is indicated in Test B, solenoid is defective. Replace solenoid. If voltage is indicated 12 V dc, but starter does not turn, starter is defective. Replace starter.

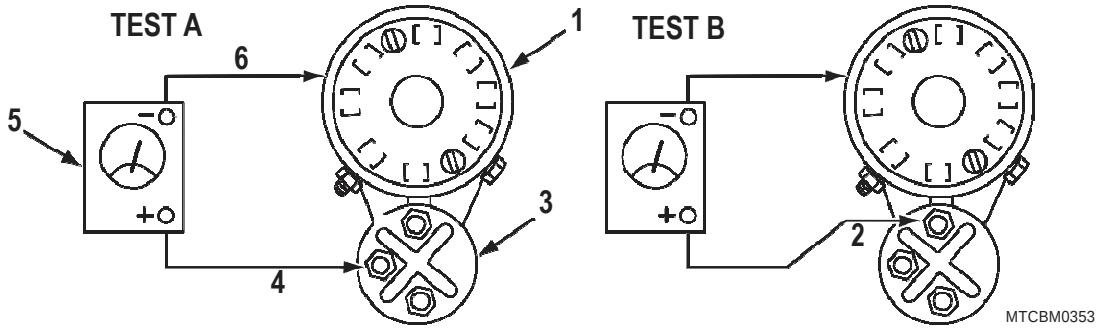


Figure 1. Engine Starter and Solenoid Voltage Test.

END OF TASK

REMOVAL

WARNING

When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

- The engine starter removal procedure is done from underneath the vehicle, on left side of engine.
- Perform Steps 2 through 4 for the Onan engine.
- Perform Steps 5 through 7 for the Lombardini engine.

1. Remove two screws (Figure 2, Items 12 and 13), lockwasher (Figure 2, Item 11), and shroud (Figure 2, Item 14) from engine (Figure 2, Item 8). Discard lockwasher (Figure 2, Item 11).
2. Remove nut (Figure 2, Item 15), lockwasher (Figure 2, Item 16), and lead (Figure 2, Item 9) from pole of solenoid (Figure 2, Item 17). Discard lockwasher (Figure 2, Item 16).
3. Remove nut (Figure 2, Item 6), lockwasher (Figure 2, Item 7), and lead (Figure 2, Item 10) from pole on rear side of solenoid (Figure 2, Item 17). Discard lockwasher (Figure 2, Item 7).

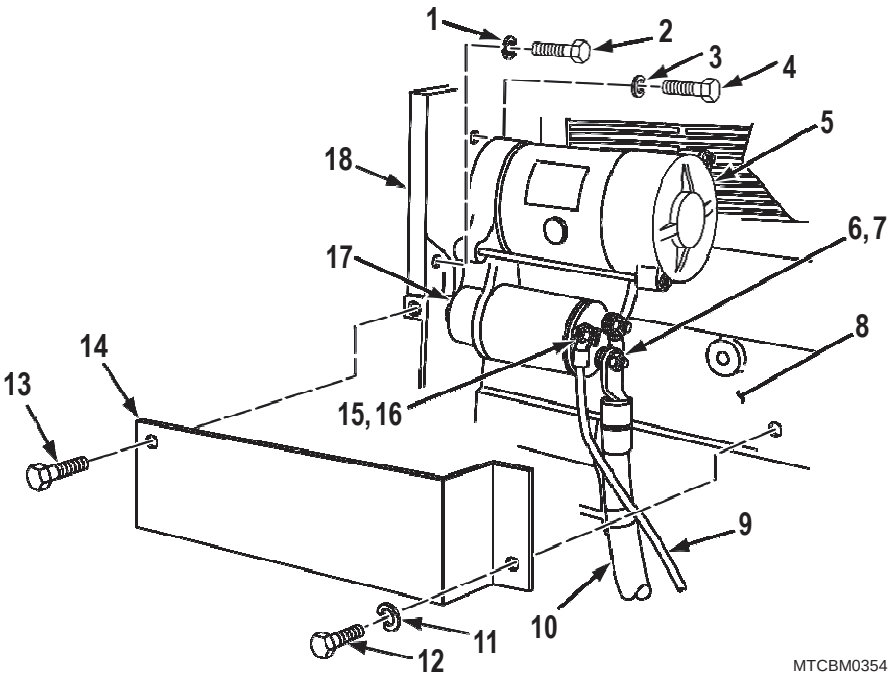


Figure 2. Onan Engine Starter and Solenoid Removal.

REMOVAL - Continued

4. Remove two screws (Figure 2, Items 2 and 4), lockwashers (Figure 2, Items 1 and 3), baffle (Figure 2, Item 18), engine starter (Figure 2, Item 5), and solenoid (Figure 2, Item 17) from engine (Figure 2, Item 8). Discard lockwashers (Figure 2, Items 1 and 3).
5. Remove nut (Figure 3, Item 2) and negative cable (Figure 3, Item 5) from starter motor (Figure 3, Item 1).
6. Remove nut (Figure 3, Item 4), lockwasher (Figure 3, Item 3), and lead (Figure 3, Item 6) from starter motor (Figure 3, Item 1). Discard lockwasher (Figure 3, Item 3).
7. Remove two nuts (Figure 3, Item 7), lockwashers (Figure 3, Item 8), and starter motor (Figure 3, Item 1) from engine. Discard lockwashers (Figure 3, Item 8).

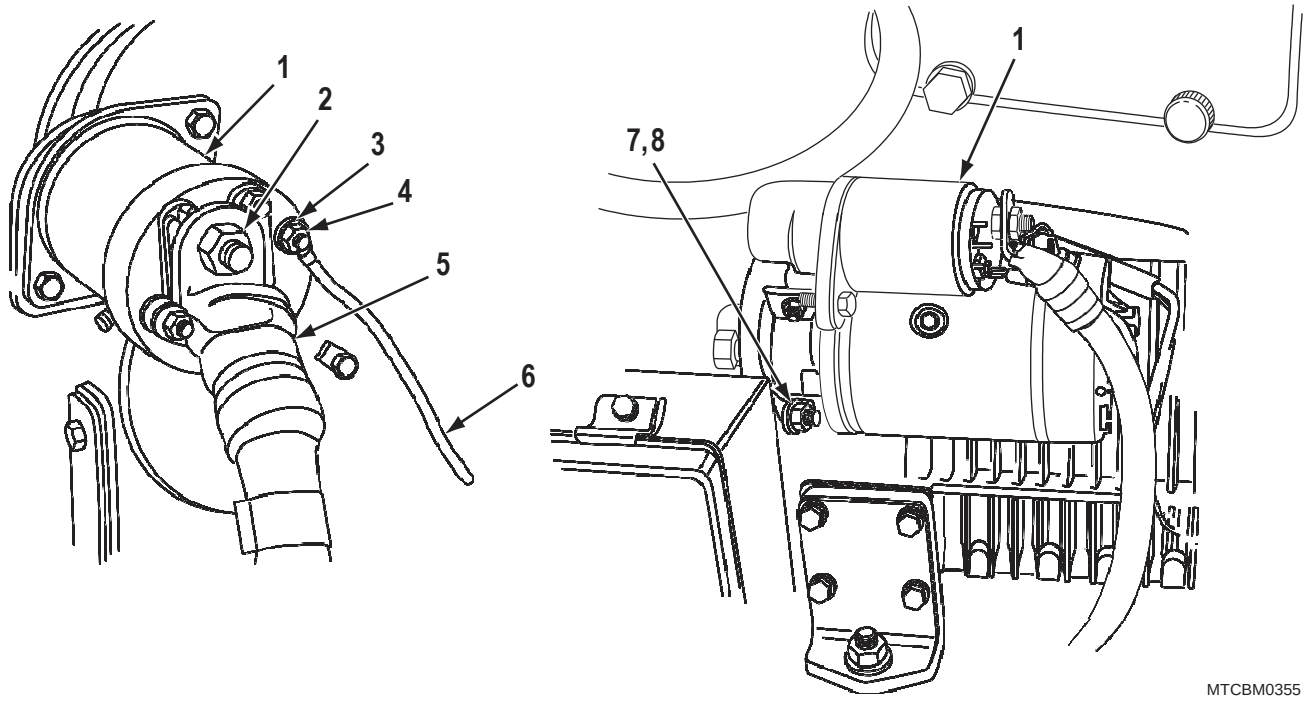


Figure 3. Lombardini Engine Starter and Solenoid Removal.

END OF TASK

DISASSEMBLY

1. Remove nut (Figure 4, Item 3), lockwasher (Figure 4, Item 4), and lead (Figure 4, Item 2) from solenoid (Figure 4, Item 5). Discard lockwasher (Figure 4, Item 4).
2. Unscrew solenoid (Figure 4, Item 5) from front housing (Figure 4, Item 6) of engine starter (Figure 4, Item 1).

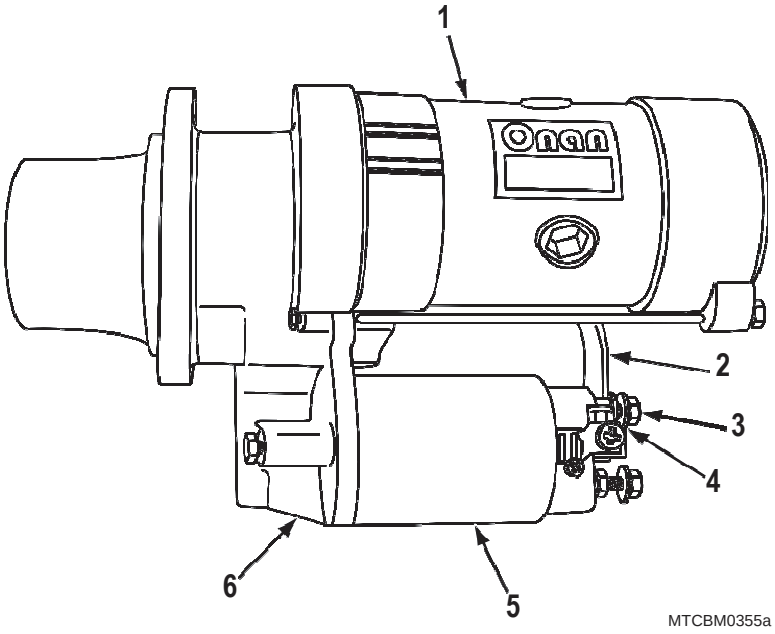


Figure 4. Onan Engine Starter and Solenoid Disassembly

END OF TASK

CLEANING AND INSPECTION

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible; DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Clean and dust off parts with compressed air or soft brush.

CAUTION

DO NOT clean parts with gasoline, in a hot solution tank or with water and alkaline solutions. DO NOT spin bearings with compressed air. Failure to comply may result in damage to, or destruction of, equipment or mission.

2. Remove grease and oil from all metal parts with solvent and rags.

CLEANING AND INSPECTION - Continued

3. Inspect solenoid switch for cracks, dents, or other damage. Make sure electrical terminals are clean and free of corrosion. After installation, make sure plunger and yoke move freely.

END OF TASK

ASSEMBLY

1. Screw solenoid (Figure 5, Item 5) into front housing (Figure 5, Item 6) of engine starter (Figure 5, Item 1).
2. Install lead (Figure 5, Item 2) on solenoid (Figure 5, Item 5) with nut (Figure 5, Item 3) and new lockwasher (Figure 5, Item 4).

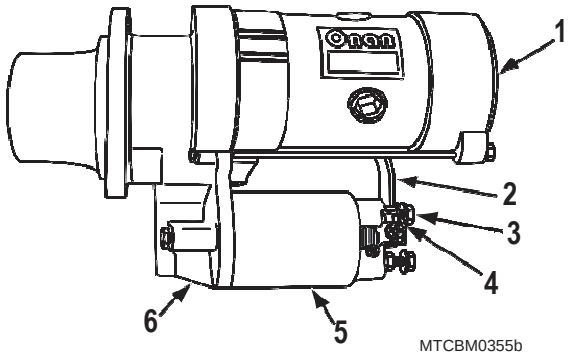


Figure 5. Onan Engine Starter and Solenoid Assembly.

END OF TASK

INSTALLATION

NOTE

Perform Steps 1 through 3 for the Lombardini engine.

1. Install starter motor (Figure 6, Item 3) on engine with two new lockwashers (Figure 6, Item 1) and nuts (Figure 6, Item 2).

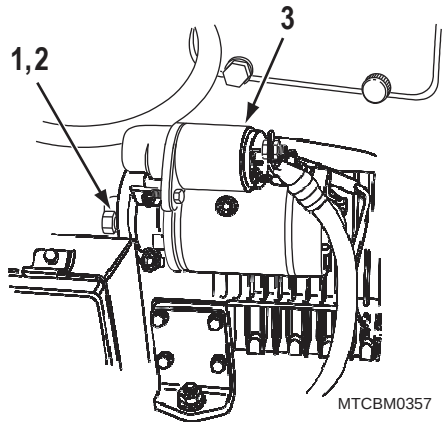


Figure 6. Lombardini Engine Stater Assembly.

2. Install lead (Figure 7, Item 6) on starter motor (Figure 7, Item 1) with new lockwasher (Figure 7, Item 3) and nut (Figure 7, Item 4).
3. Install negative cable (Figure 7, Item 5) on starter motor (Figure 7, Item 1) with nut (Figure 7, Item 2).

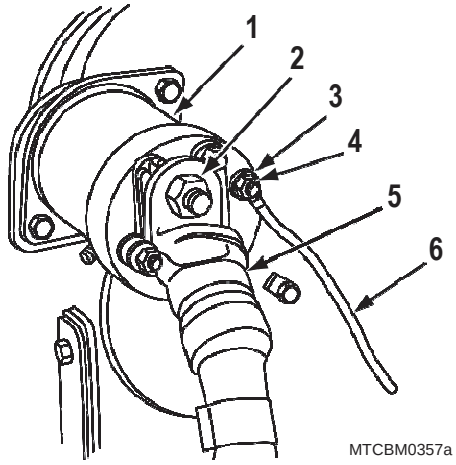


Figure 7. Lombardini Solenoid Assembly.

INSTALLATION - Continued

NOTE

Perform Steps 4 through 7 for the Onan engine.

4. Install engine starter (Figure 8, Item 5), solenoid (Figure 8, Item 17), and baffle (Figure 8, Item 18) on engine (Figure 8, Item 8) with two screws (Figure 8, Items 2 and 4) and new lockwashers (Figure 8, Items 1 and 3).
5. Install lead (Figure 8, Item 10), new lockwasher (Figure 8, Item 7), and nut (Figure 8, Item 6) on pole on rear side of solenoid (Figure 8, Item 17).
6. Install lead (Figure 8, Item 9), new lockwasher (Figure 8, Item 16). and nut (Figure 8, Item 15) on pole of solenoid (Figure 8, Item 17).
7. Install shroud (Figure 8, Item 14), two screws (Figure 8, Items 12 and 13), and new lockwasher (Figure 8, Item 11) on engine (Figure 8, Item 8).

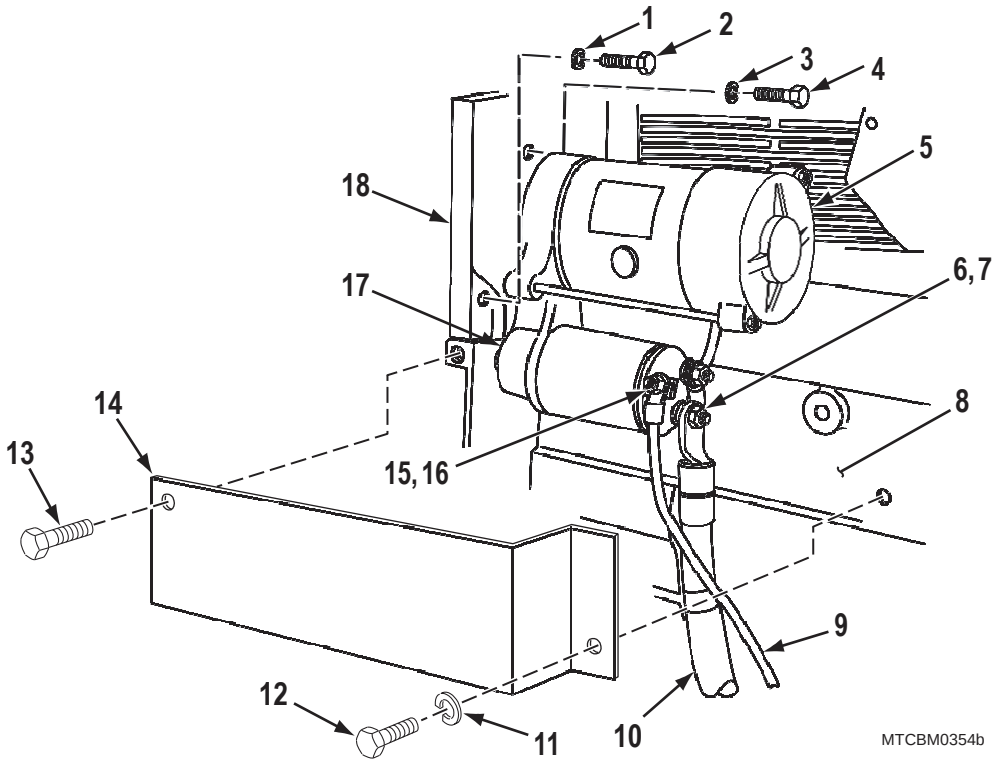


Figure 8. Onan Engine Starter and Solenoid Assembly

END OF TASK

FOLLOW ON TASK

Connect negative battery cables (WP 0007).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
GLOW PLUGS MAINTENANCE (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 27)

Equipment Condition
Negative battery cables disconnected WP 0098

Equipment Condition (cont.)
Semitrailer bonded and grounded WP 0008
Semitrailer uncoupled WP 0007

WARNING

When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Tag all electrical leads and connections prior to removal for ease of installation.

REMOVAL

1. Remove two nuts (Figure 1, Item 5) and five electrical leads (Figure 1, Items 3, 4, 6, 7, and 8) from two glow plugs (Figure 1, Item 1).
2. Remove strap (Figure 1, Item 2) from two glow plugs (Figure 1, Item 1).
3. Remove two glow plugs (Figure 1, Item 1) from air intake manifold (Figure 1, Item 9).

END OF TASK

INSPECTION

WARNING

With preheater switch in PREHEAT position, 12 V dc are applied to glow plugs. Do not handle glow plugs with preheater switch in PREHEAT position. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Ensure electrical leads to glow plugs are clean and secure.

END OF TASK

INSTALLATION

1. Install two glow plugs (Figure 1, Item 1) on air intake manifold (Figure 1, Item 9). Torque glow plugs 120-180 lb in. (13-20 N·m).
2. Install strap (Figure 1, Item 2) on glow plugs (Figure 1, Item 1).
3. Install five electrical leads (Figure 1, Items 3, 4, 6, 7, and 8) and two new nuts (Figure 1, Item 5) on two glow plugs (Figure 1, Item 1).

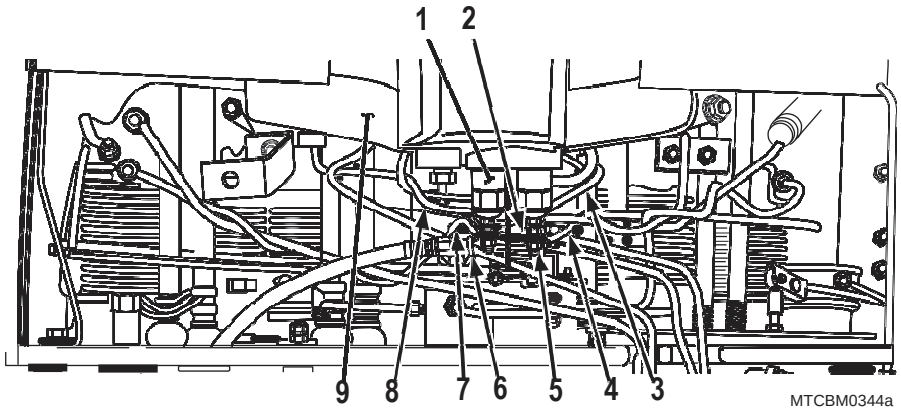


Figure 1. Glow Plug Replacement.

END OF TASK

FOLLOW ON TASK

Connect negative battery cables (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE HIGH-TEMP THERMOSTAT CONTROL SWITCH REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Washer, Lock (WP 0295, Table 1, Item 111)
Washer, Lock (WP 0295, Table 1, Item 122)

Equipment Condition
Air shutter assembly removed (WP 0215)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)
Negative battery cables disconncted (WP 0098)

REMOVAL (ONAN)

1. Disconnect two leads (Figure 1, Item 10) from engine high-temp thermostat control switch (Figure 1, Item 9) and switch terminal (Figure 1, Item 3).
2. Remove screw (Figure 1, Item 6) and switch bracket (Figure 1, Item 11) from exhaust manifold.
3. Remove nut (Figure 1, Item 1), lockwasher (Figure 1, Item 2), terminal (Figure 1, Item 3), washer (Figure 1, Item 4), two insulated washers (Figure 1, Item 5), insulated sleeve (Figure 1, Item 7) two insulated washers (Figure 1, Item 8), and switch (Figure 1, Item 9) from switch bracket (Figure 1, Item 11). Discard lockwasher (Figure 1, Item 2).

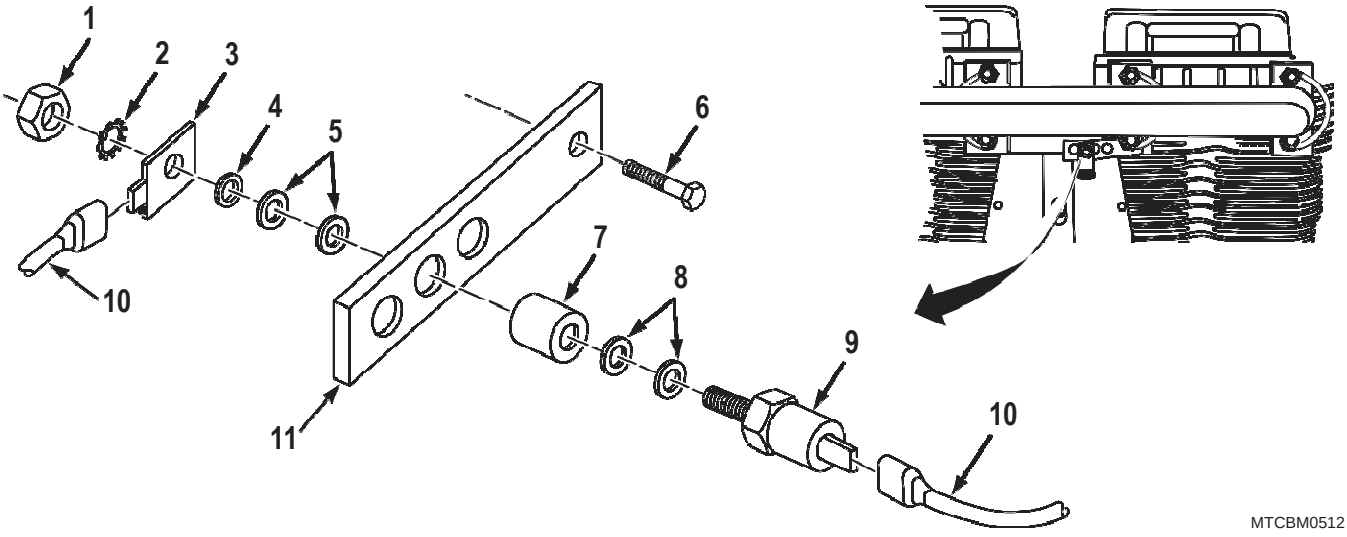


Figure 1. High Temp Thermostat Switch Removal (ONAN).

END OF TASK

INSTALLATION (ONAN)

1. Install switch (Figure 2, Item 9) on switch bracket (Figure 2, Item 11) with nut (Figure 2, Item 1), new lockwasher (Figure 2, Item 2), terminal (Figure 2, Item 3), washer (Figure 2, Item 4), two insulated washers (Figure 2, Item 5), insulated sleeve (Figure 2, Item 7), and two insulated washers (Figure 2, Item 8).
2. Install switch bracket (Figure 2, Item 11) on exhaust manifold with screw (Figure 2, Item 6).
3. Connect two leads (Figure 2, Item 10) to switch (Figure 2, Item 9) and switch terminal (Figure 2, Item 3).

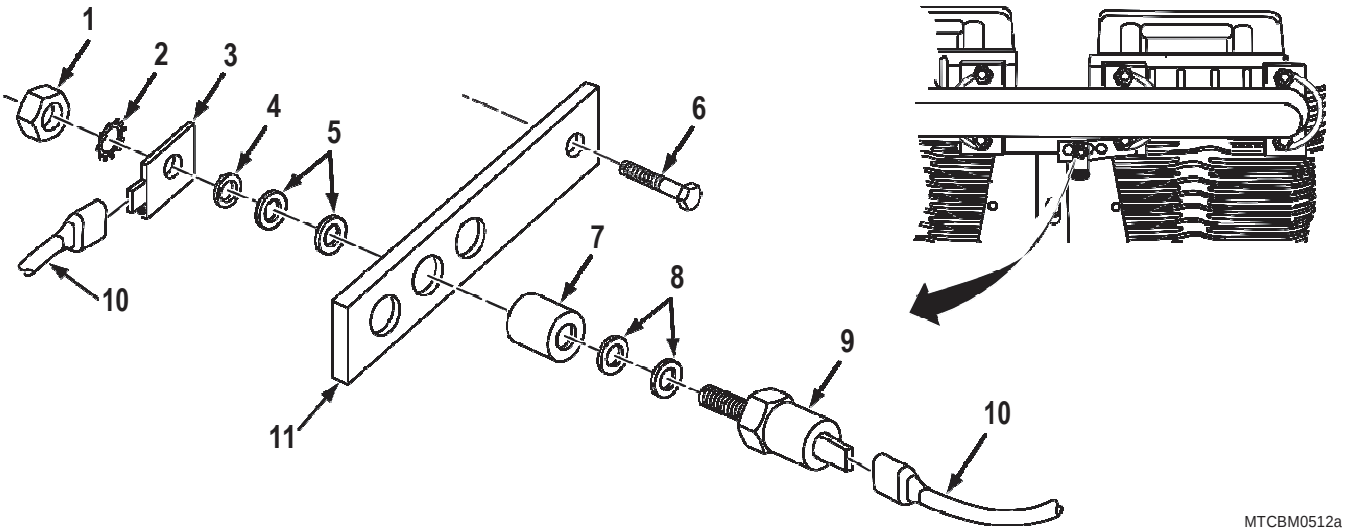


Figure 2. High Temp Thermostat Switch Installation (ONAN).

END OF TASK

REMOVAL (LOMBARDINI)

Remove bolt (Figure 3, Item 1), lockwasher (Figure 3, Item 2), and thermostat (Figure 3, Item 3) from nut (Figure 3, Item 4) on engine (Figure 3, Item 5). Discard lockwasher (Figure 3, Item 2).

END OF TASK

INSTALLATION (LOMBARDINI)

Install thermostat (Figure 3, Item 3) on nut (Figure 3, Item 4) with new lockwasher (Figure 3, Item 2) and bolt (Figure 3, Item 1) on engine (Figure 3, Item 5).

INSTALLATION (LOMBARDINI) - Continued

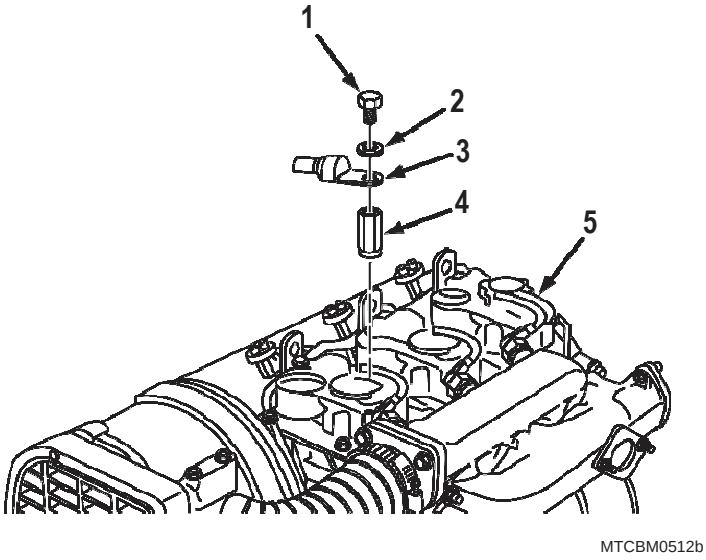


Figure 3. High Temp Thermostat Switch Replacement (LOMBARDINI).

END OF TASK

FOLLOW ON TASK

1. Install air shutter assembly (WP 0215).
2. Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BUSS BAR CONNECTOR REPAIR

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Riveter, Blind Hand (WP 0294, Table 1, Item 17)

Materials/Parts
Grommet, Non-Metallic (WP 0295, Table 1, Item 198)
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (2) (WP 0295, Table 1, Item 164)
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 161)
Retaining Clip (WP 0295, Table 1, Item 34)
Rivet (WP 0295, Table 1, Item 35)

Equipment Condition
Negative battery cables disconnected (WP 0098)
Semitrailer uncoupled (WP 0007)

WARNING

When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Tag all electrical leads and connections prior to removal for ease of installation.

REMOVAL

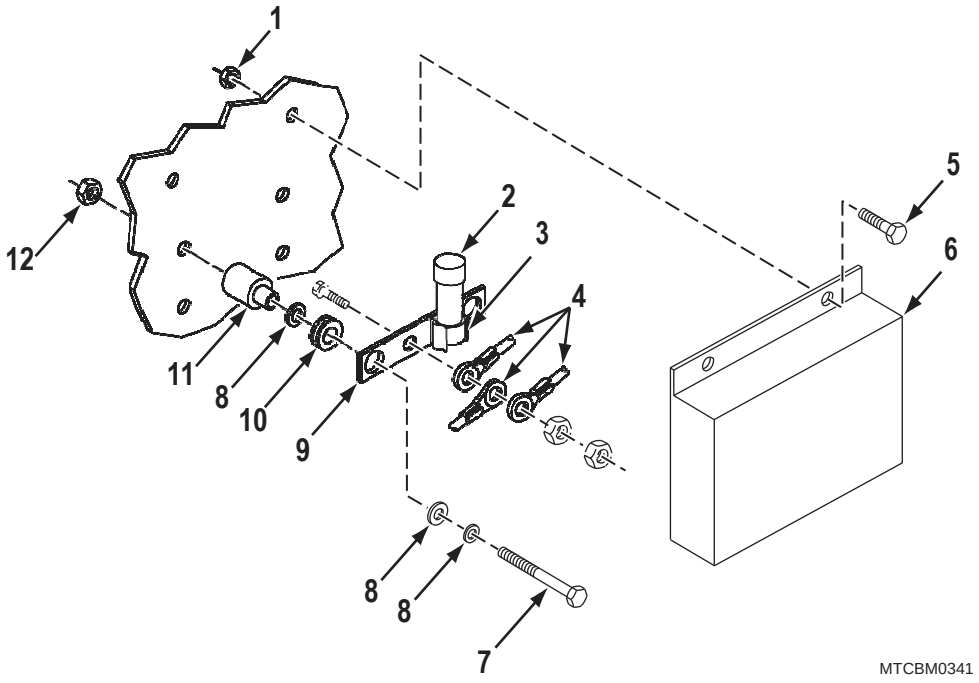


Figure 1. Buss Bar Removal.

1. Remove two screws (Figure 1, Item 5), self-locking nuts (Figure 1, Item 1), and buss bar cover (Figure 1, Item 6) from firewall. Discard self-locking nuts (Figure 1, Item 1).
2. Remove fuse (Figure 1, Item 2) from retaining clip (Figure 1, Item 3).
3. Disconnect all electrical leads (Figure 1, Item 4) from buss bar assembly (Figure 1, Item 9).
4. Remove screws (Figure 1, Item 7), flatwashers (Figure 1 Items 8), buss bar assembly (Figure 1, Item 9), grommets (Figure 1, Item 10), spacers (Figure 1, Item 11), and self-locking nuts (Figure 1, Item 12) from firewall. Discard grommets (Figure 1, Item 10) and self-locking nuts (Figure 1, Item 12).

END OF TASK

REPAIR

1. Remove crimped end of rivet (Figure 2, Item 3).
2. Drive rivet from buss bar (Figure 2, Item 1) and retaining clip (Figure 2, Item 2). Discard retaining clip (Figure 2, Item 2) and rivet (Figure 2, Item 3).
3. Install new retaining clip (Figure 2, Item 2) and rivet (Figure 2, Item 3) on buss bar (Figure 2, Item 1).

REPAIR - Continued

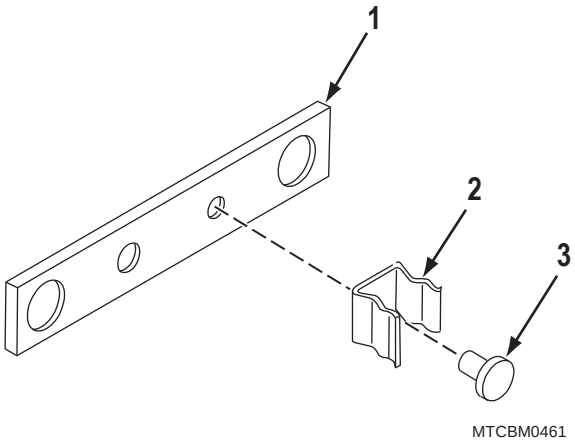


Figure 2. Buss Bar Repair.

END OF TASK

INSTALLATION

1. Install buss bar assembly (Figure 1, Item 9) on firewall with two screws (Figure 1, Item 7), flatwashers (Figure 1, Item 8), new grommets (Figure 1, Item 10), spacers (Figure 1, Item 11), and new self-locking nuts (Figure 1, Item 12).
2. Connect all electrical leads (Figure 1, Item 4) to buss bar assembly (Figure 1, Item 9).
3. Install fuse (Figure 1, Item 2) in retaining clip (Figure 1, Item 3).
4. Install buss bar cover (Figure 1, Item 6) on firewall with two screws (Figure 1, Item 5) and new self-locking nuts (Figure 1, Item 1).

END OF TASK

FOLLOW ON TASK

Connect negative battery cables (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE ELECTRICAL LEAD ASSEMBLY MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0288

Equipment Condition
Negative battery cables disconnected (WP 0098)

Equipment Condition (cont.)
Engine control panel removed (WP 0224)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Refer to engine electrical wiring schematic for location, removal, and installation of electrical wiring (WP 0288).

REPAIR

1. Check ends of wire harness and leads for frayed insulation and broken wires (Figure 1). Tape or replace frayed wires.
2. Inspect wires for bent, broken, or missing terminals (Figure 1). Replace missing or damaged terminals.

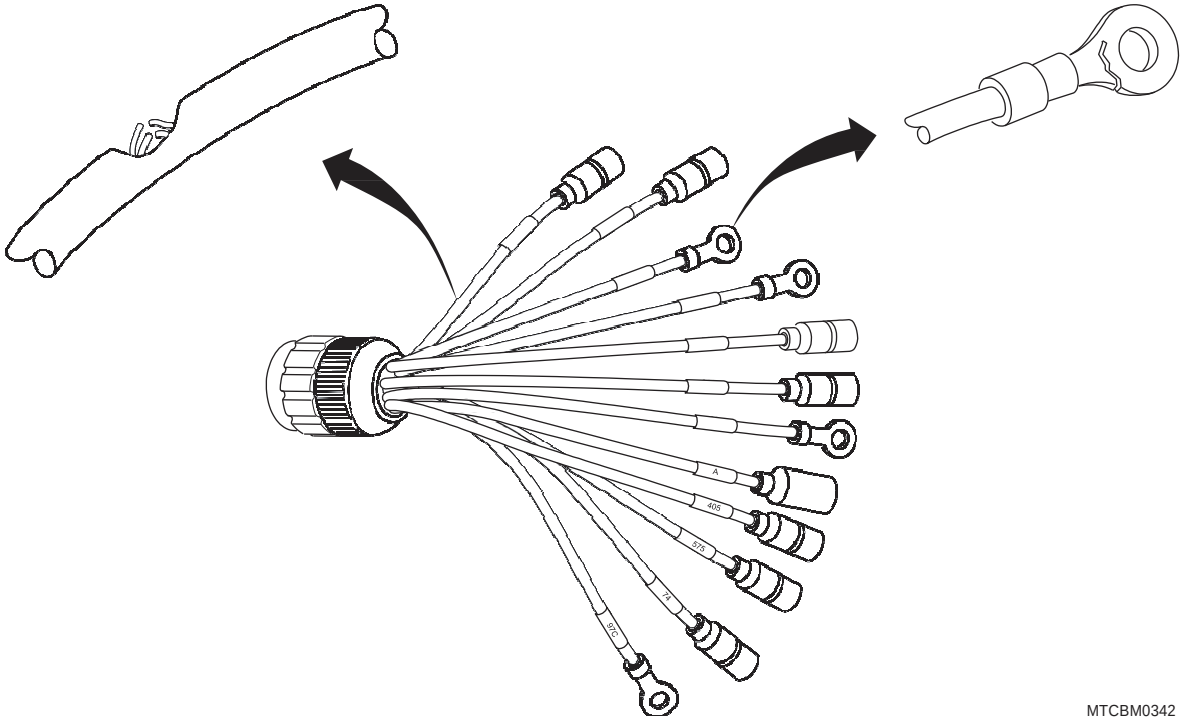


Figure 1. Engine Electrical Lead Assembly Removal.

END OF TASK

FOLLOW ON TASK

1. Install engine control panel (WP 0224).
2. Connect ground cables (WP 0098).
3. Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE ELECTRICAL BOX REPAIR

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 90)
Locknut, Electrical
Qty: (5) (WP 0295, Table 1, Item 134)
Nut, Self-locking
Qty: (2) (WP 0295, Table 1, Item 161)
O-Ring Qty: (5) (WP 0295, Table 1, Item 206)
Washer, Lock
Qty: (4) (WP 0295, Table 1, Item 191)
Washer, Lock
Qty: (4) (WP 0295, Table 1, Item 188)
Washer, Lock
Qty: (10) (WP 0295, Table 1, Item 192)

Equipment Condition
Negative battery cables disconnected (WP 0098)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

Tag all electrical leads and connections prior to removal for ease of installation.

DISASSEMBLY

1. Loosen two clip screws (Figure 1, Item 10) and open electrical box cover (Figure 1, Item 9). Remove gasket (Figure 1, Item 16) from electrical box cover (Figure 1, Item 9). Discard gasket (Figure 1, Item 16).
2. Disconnect all leads in engine electrical box (Figure 1, Item 5) and remove completely.
3. Remove four capscrews (Figure 1, Item 1), lockwashers (Figure 1, Item 13), and nuts (Figure 1, Item 12). Remove wiring harness (Figure 1, Item 2) from electrical box (Figure 1, Item 5). Discard lockwashers (Figure 1, Item 13).
4. Remove five electrical connectors (Figure 1, Item 3), electrical locknuts (Figure 1, Item 11), and O-rings (Figure 1, Item 4) from electrical box (Figure 1, Item 5). Discard locknuts (Figure 1, Item 11) and O-rings (Figure 1, Item 4).
5. Remove four screws (Figure 1, Item 15) and lockwashers (Figure 1, Item 14) from mounting plate (Figure 1, Item 25). Remove mounting plate (Figure 1, Item 25) from electrical box (Figure 1, Item 5). Discard lockwashers (Figure 1, Item 14).
6. Remove two capscrews (Figure 1, Item 8) and self-locking nuts (Figure 1, Item 7) from electrical box (Figure 1, Item 5). Remove electrical box (Figure 1, Item 5) from angle mounting plate (Figure 1, Item 6). Discard self-locking nuts (Figure 1, Item 7).
7. Remove two screws (Figure 1, Item 29), lockwashers (Figure 1, Item 30), and circuit breaker (Figure 1, Item 31) from mounting plate (Figure 1, Item 25). Discard lockwashers (Figure 1, Item 30).
8. Remove two screws (Figure 1, Item 22), lockwashers (Figure 1, Item 23) and bracket (Figure 1, Item 24) from mounting plate (Figure 1, Item 25). Discard lockwashers (Figure 1, Item 23).
9. Remove two screws (Figure 1, Item 21) and circuit breaker (Figure 1, Item 20) from bracket (Figure 1, Item 24).
10. Remove two screws (Figure 1, Item 19), lockwashers (Figure 1, Item 18), and solenoid (Figure 1, Item 17) from mounting plate (Figure 1, Item 25). Discard lockwashers (Figure 1, Item 18).
11. Remove four screws (Figure 1, Item 27), lockwashers (Figure 1, Item 28), and terminal board (Figure 1, Item 26) from electrical box (Figure 1, Item 5). Discard lockwashers (Figure 1, Item 28).

END OF TASK

ASSEMBLY

1. Install terminal board (Figure 1, Item 26), four new lockwashers (Figure 1, Item 28), and screws (Figure 1, Item 27) on mounting plate (Figure 1, Item 25).
2. Install solenoid (Figure 1, Item 17), two new lockwashers (Figure 1, Item 18), and screws (Figure 1, Item 19) on mounting plate (Figure 1, Item 25).
3. Install circuit breaker (Figure 1, Item 20), bracket (Figure 1, Item 24), and two screws (Figure 1, Item 21) on mounting plate (Figure 1, Item 25).
4. Install two new lockwashers (Figure 1, Item 23) and screws (Figure 1, Item 22) on mounting plate (Figure 1, Item 25).
5. Install circuit breaker (Figure 1, Item 31), two new lockwashers (Figure 1, Item 30), and screws (Figure 1, Item 29) on mounting plate (Figure 1, Item 25).
6. Install electrical box (Figure 1, Item 5), two capscrews (Figure 1, Item 8), and new self-locking nuts (Figure 1, Item 7) on mounting plate (Figure 1, Item 16).
7. Install mounting plate (Figure 1, Item 25), four lockwashers (Figure 1, Item 14), and screws (Figure 1, Item 15) on electrical box (Figure 1, Item 5).

ASSEMBLY - Continued

8. Install five new O-rings (Figure 1, Item 4), electrical connectors (Figure 1, Item 3), and new electrical locknuts (Figure 1, Item 11) on electrical box (Figure 1, Item 5).
9. Install wiring harness (Figure 1, Item 2), four capscrews (Figure 1, Item 1), new lockwashers (Figure 1, Item 13), and nuts (Figure 1, Item 12) on electrical box (Figure 1, Item 5),
10. Connect all electrical leads in electrical box (Figure 1, Item 5).
11. Install new gasket (Figure 1, Item 16) on electrical box cover (Figure 1, Item 9), close cover (Figure 1, Item 9) and tighten two clip screws (Figure 1, Item 10).

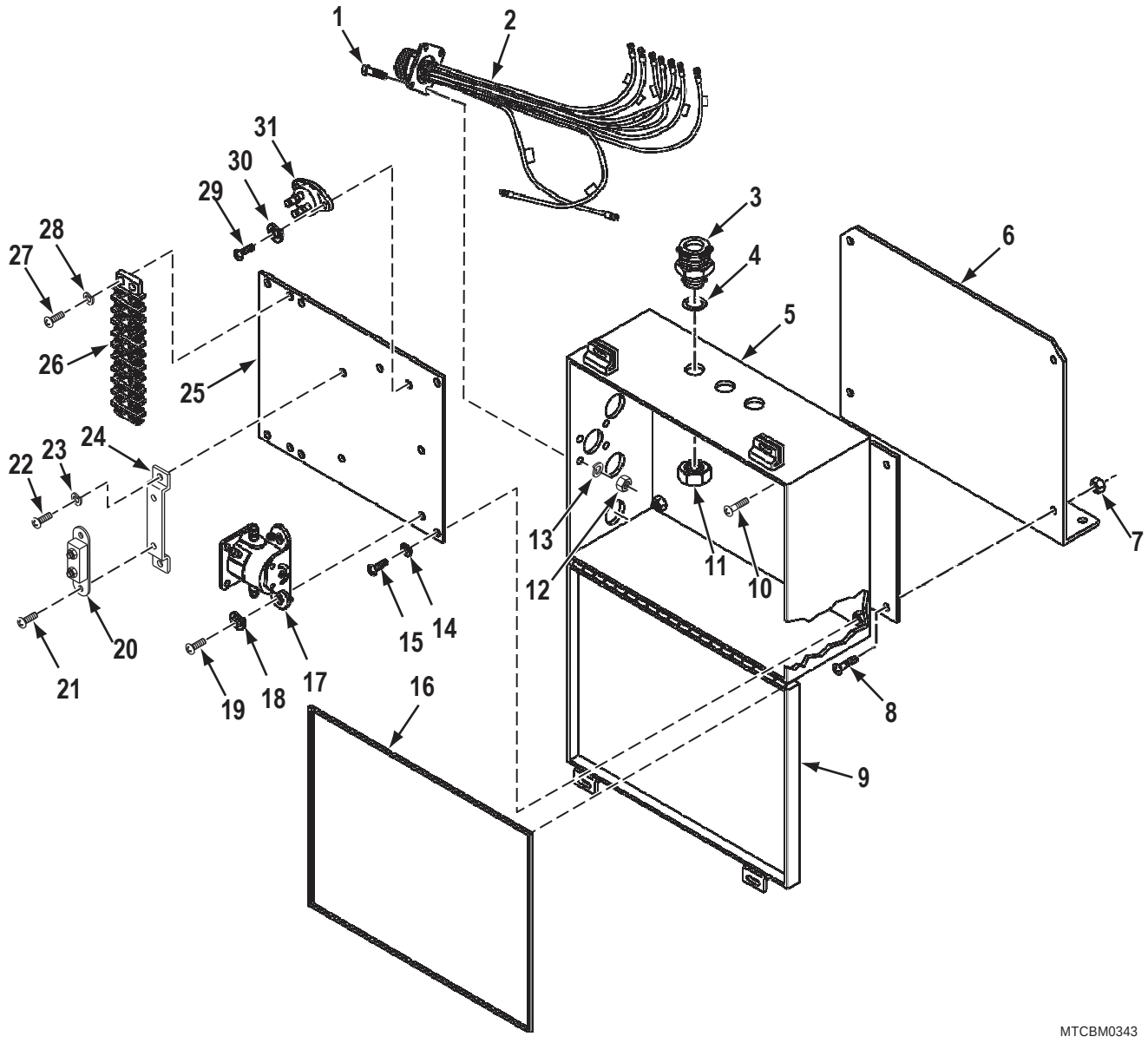


Figure 1. Engine Electrical Box Maintenance.

END OF TASK

FOLLOW ON TASK

Connect negative battery cables (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL STOP SOLENOID MAINTENANCE (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

Equipment Condition
Negative battery cables disconnected (WP 0098)

REMOVAL

1. Remove two screws (Figure 1, Item 10), washers (Figure 1, Item 9), and positive and negative leads (Figure 1, Items 8 and 6) from solenoid (Figure 1, Item 5).
2. Remove two screws (Figure 1, Item 2), washers (Figure 1, Item 1), and bracket (Figure 1, Item 3) with solenoid (Figure 1, Item 5) from engine mounting bracket (Figure 1, Item 11).
3. Remove four screws (Figure 1, Item 7), nuts (Figure 1, Item 4), negative lead (Figure 1, Item 6), and solenoid (Figure 1, Item 5) from bracket (Figure 1, Item 11).

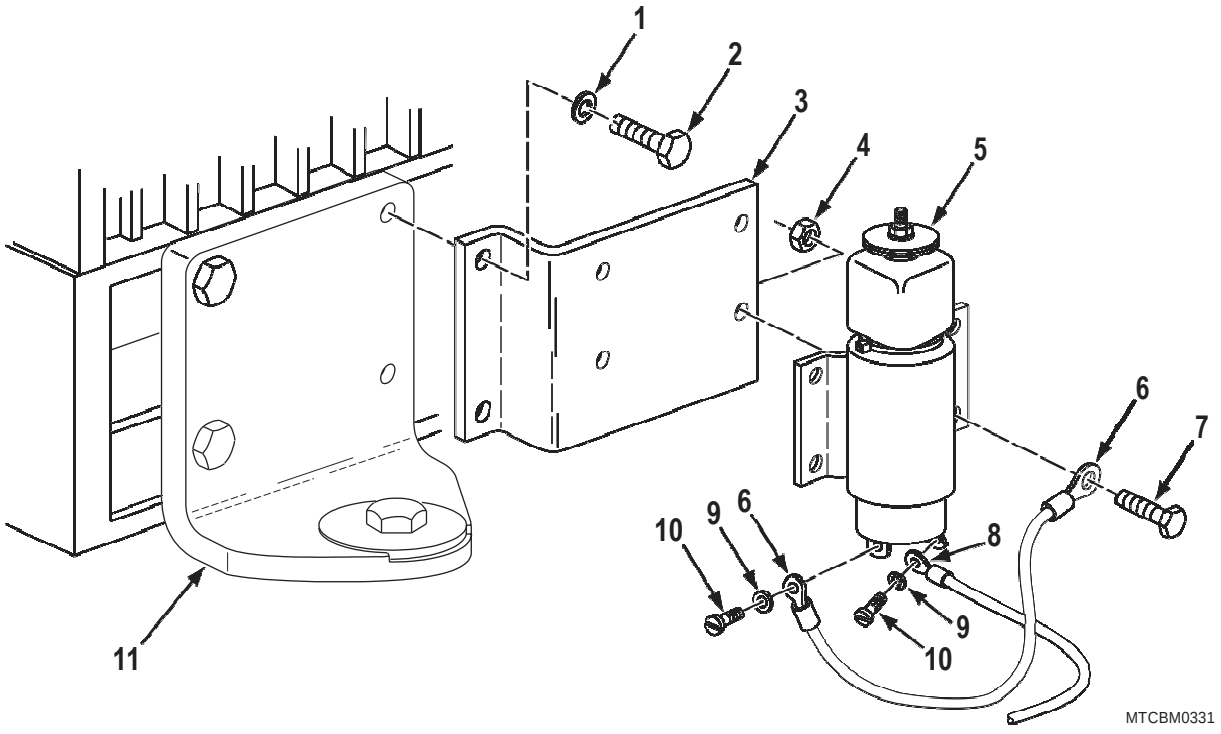


Figure 1. Fuel Stop Solenoid Removal.

END OF TASK

INSTALLATION

1. Install solenoid (Figure 2, Item 5) and negative lead (Figure 2, Item 6) on bracket (Figure 2, Item 3) with four screws (Figure 2, Item 7) and nuts (Figure 2, Item 4).
2. Install bracket (Figure 2, Item 3) with solenoid (Figure 2, Item 5) on engine mount (Figure 2, Item 11) with two washers (Figure 2, Item 1) and screws (Figure 2, Item 2).
3. Install positive and negative leads (Figure 2, Items 8 and 6) on solenoid (Figure 2, Item 5) with two washers (Figure 2, Item 9) and screws (Figure 2, Item 10).

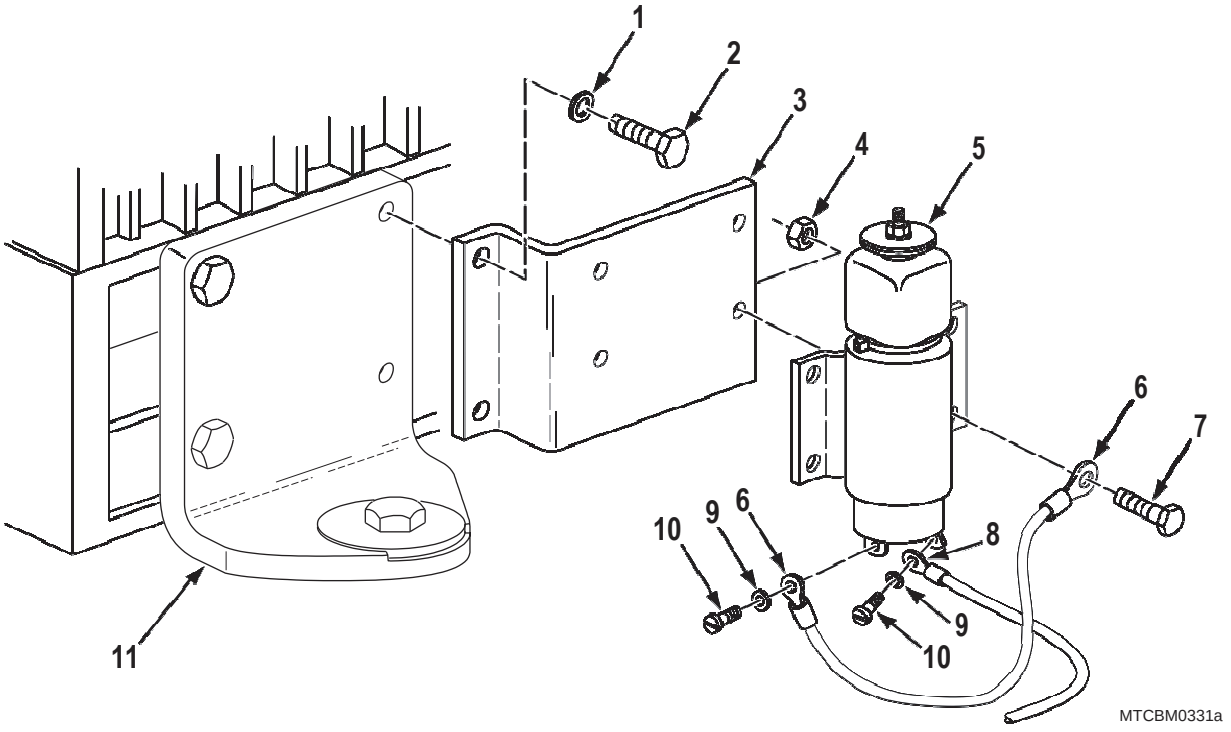


Figure 2. Fuel Stop Solenoid Installation.

END OF TASK

FOLLOW ON TASK

Connect negative battery cables (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE FUEL STOP SOLENOID MAINTENANCE (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Rag, Wiping (WP 0293, Table 1, Item 20)
Washer, Lock

Materials/Parts (cont.)
Qty: (2) (WP 0295, Table 1, Item 118)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Loosen two retaining screws (Figure 1, Item 1) and remove engine door panel (Figure 1, Item 2) from engine assembly (Figure 1, Item 3).

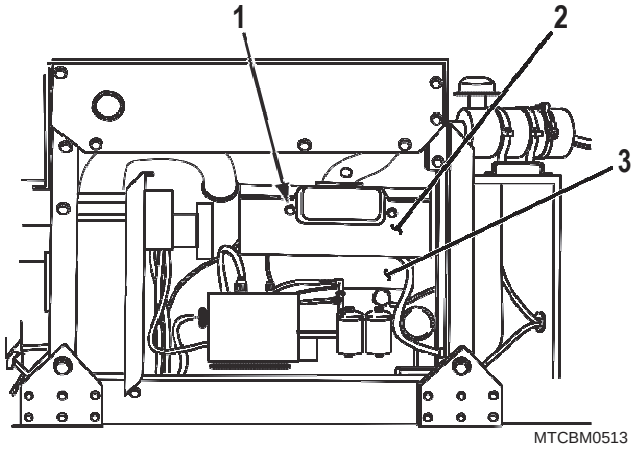


Figure 1. Engine Door Panel Removal.

REMOVAL - Continued

2. Remove two screws (Figure 2, Item 3), lockwashers (Figure 2, Item 2), and leads (Figure 2, Items 1 and 4) from engine fuel stop solenoid (Figure 2, Item 7). Retain lockwashers (Figure 2, Item 2).
3. Remove two screws (Figure 2, Item 5), lockwashers (Figure 2, Item 6), and solenoid (Figure 2, Item 7) from bottom cylinder pan. Discard lockwashers (Figure 2, Item 6).

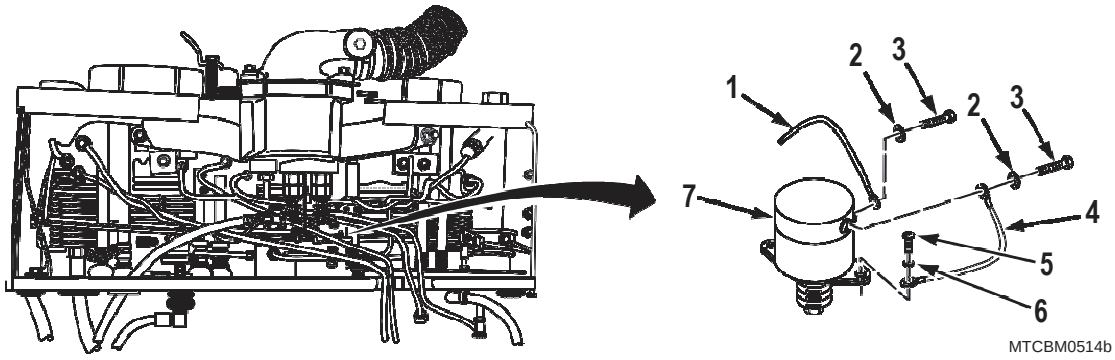


Figure 2. Engine Fuel Stop Solenoid Removal.

END OF TASK

ADJUSTMENT

NOTE

- Solenoid plunger should be adjusted to fully stop injection when in de-energized position.
- If solenoid plunger sticks, remove engine fuel stop solenoid and clean plunger and plunger recess.

To adjust length of solenoid plunger (Figure 3, Item 1) turn adjusting screw (Figure 3, Item 3) and jamnut (Figure 3, Item 2) clockwise to move solenoid plunger (Figure 3, Item 1) out, counterclockwise to move solenoid plunger (Figure 3, Item 1) in.

ADJUSTMENT - Continued

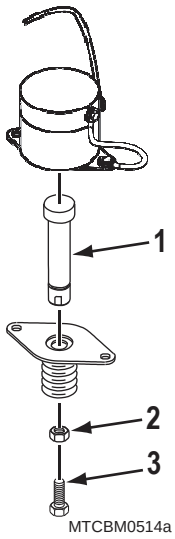


Figure 3. Engine Fuel Stop Solenoid Adjustment.

END OF TASK

INSTALLATION

1. Install solenoid (Figure 4, Item 7) on bottom cylinder pan with two screws (Figure 4, Item 5) and new lockwashers (Figure 4, Item 6).
2. Install leads (Figure 4, Items 1 and 4) to solenoid (Figure 4, Item 7) with screws (Figure 4, Item 3) and lockwashers (Figure 4, Item 2).

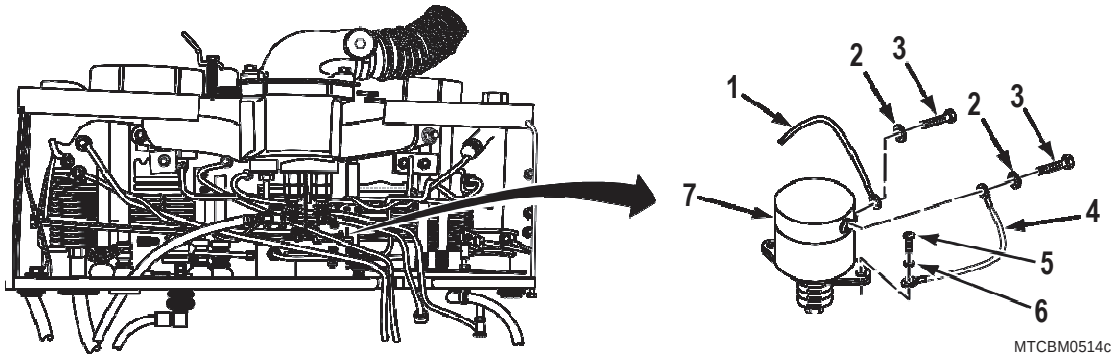


Figure 4. Engine Fuel Stop Solenoid Installation

INSTALLATION - Continued

3. Install engine door panel (Figure 5, Item 2) on engine assembly (Figure 5, Item 3) with two retaining screws (Figure 5, Item 1).

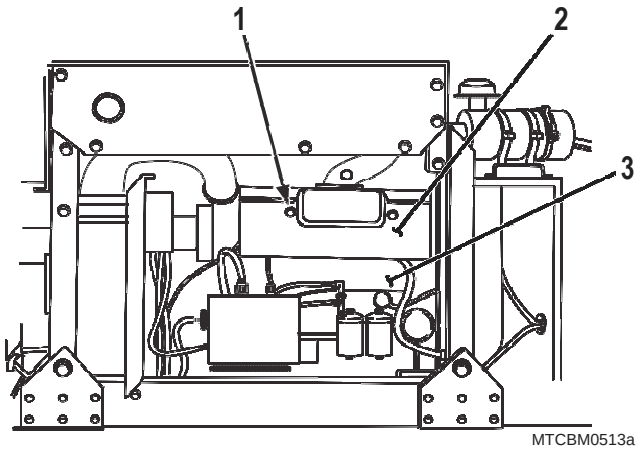


Figure 5. Engine Door Panel Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENGINE CONTROL PANEL AND WIRING MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (28) (WP 0295, Table 1, Item 178)
Washer, Lock (WP 0295, Table 1, Item 190)

Equipment Condition
Negative battery cables disconnnected (WP 0098)
Semitrailer bonded and grounded (WP 0008)

WARNING

When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

NOTE

- Removal of engine control panel is not required for replacement of switches, gages, meters, and indicator light.
- Semitrailers equipped with Lombardini engine do not have fuel pressure gage.
- Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Release fastener (Figure 1, Item 4), and open control panel cover (Figure 1, Item 1).
2. Remove six screws (Figure 1, Item 6) from engine control panel (Figure 1, Item 2) and swing control panel (Figure 1, Item 1) down.
3. Remove two screws (Figure 1, Item 3), self-locking nuts (Figure 1, Item 5), and fastener (Figure 1, Item 4) from control panel (Figure 1, Item 2). Discard self-locking nuts (Figure 1, Item 5).

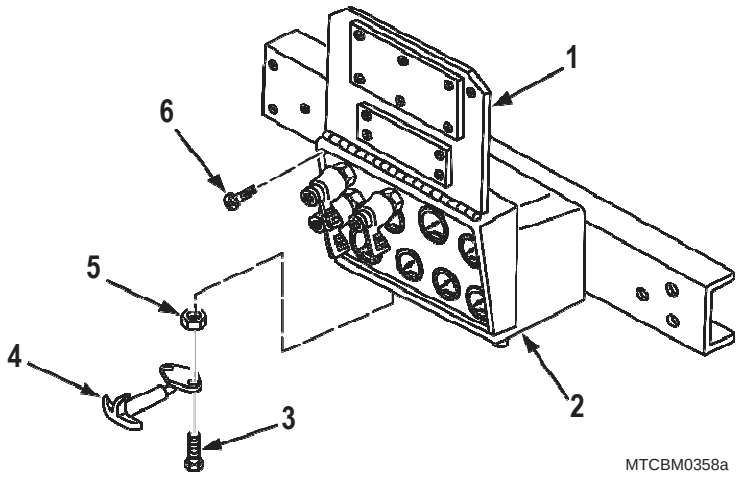


Figure 1. Engine Control Panel Removal.

4. Disconnect all electrical leads (Figure 2, Item 13), jumper assemblies (Figure 2, Item 2), and electrical components (Figure 2, Item 1) from control panel wiring harness (Figure 2, Item 3).
5. Remove control panel harness conduit adapter (Figure 2, Item 5) from back of control panel (Figure 2, Item 4).
6. Remove control panel light conduit adapter (Figure 2, Item 12) from side of control panel (Figure 2, Item 4).

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL - Continued

7. Disconnect fuel/oil lines (Figure 2, Item 6) from adapters (Figure 2, Item 7) on pump pressure gage (Figure 2, Item 11), filter/separator gage (Figure 2, Item 8), fuel pressure gage (Figure 2, Item 10), and oil pressure gage (Figure 2, Item 9).

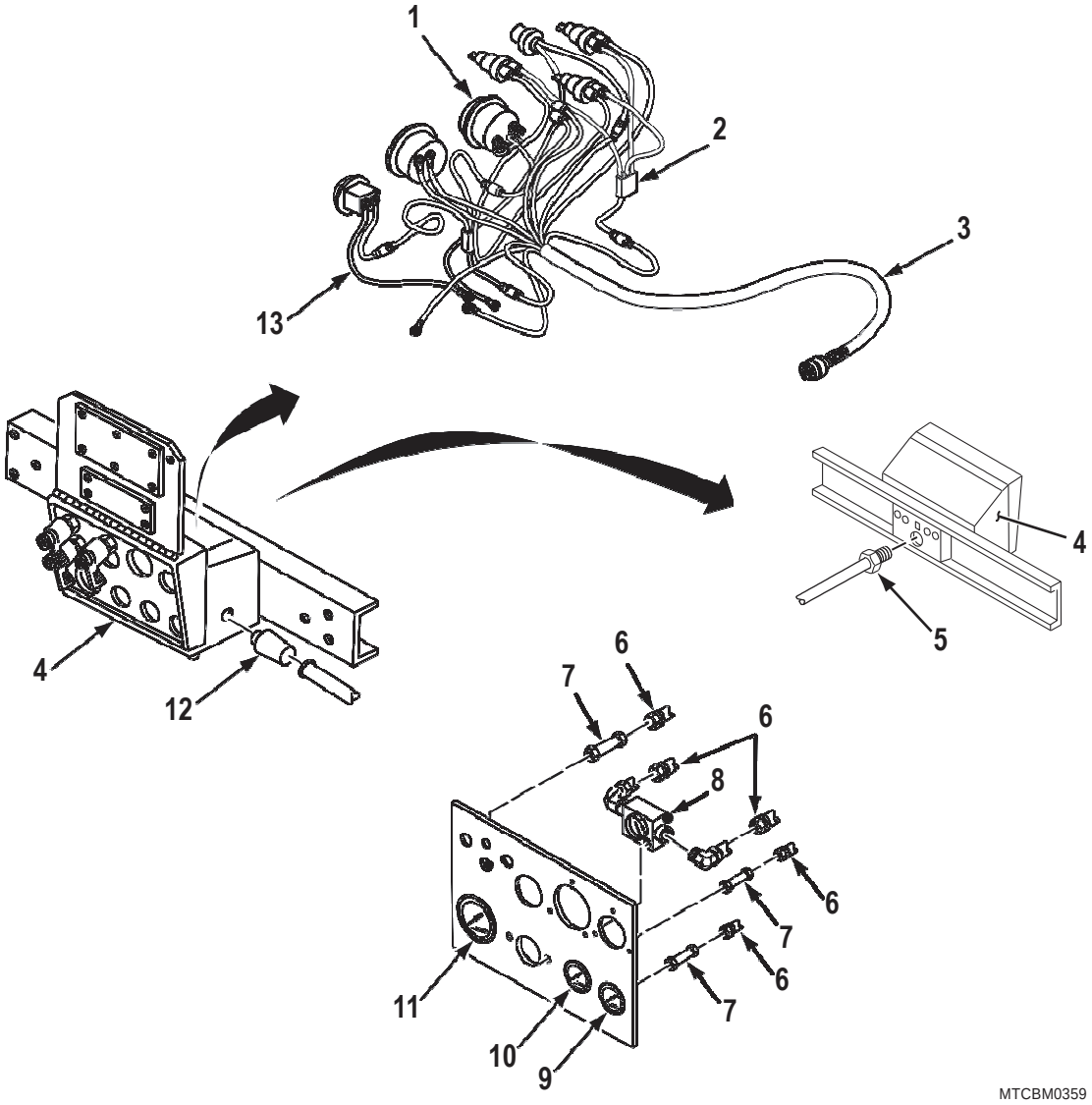


Figure 2. Engine Control Panel Gages Removal.

REMOVAL - Continued

8. Remove screw (Figure 3, Item 7), and handle (Figure 3, Item 6) from throttle cable (Figure 3, Item 1).
9. Remove packing nut (Figure 3, Item 5), jamnut (Figure 3, Item 4), and washer (Figure 3, Item 3) from throttle cable (Figure 3, Item 1). Pull throttle cable (Figure 3, Item 1) through channel of control panel (Figure 3, Item 2).
10. Remove screw (Figure 3, Item 12), lever (Figure 3, Item 11), nut (Figure 3, Item 10), washer (Figure 3, Item 9), and valve (Figure 3, Item 8) from channel of control panel (Figure 3, Item 2).
11. Remove four screws (Figure 3, Item 13), eight washers (Figure 3, Item 14), four self-locking nuts (Figure 3, Item 15), and control panel (Figure 3, Item 2) from semitrailer. Discard self-locking nuts (Figure 3, Item 15).

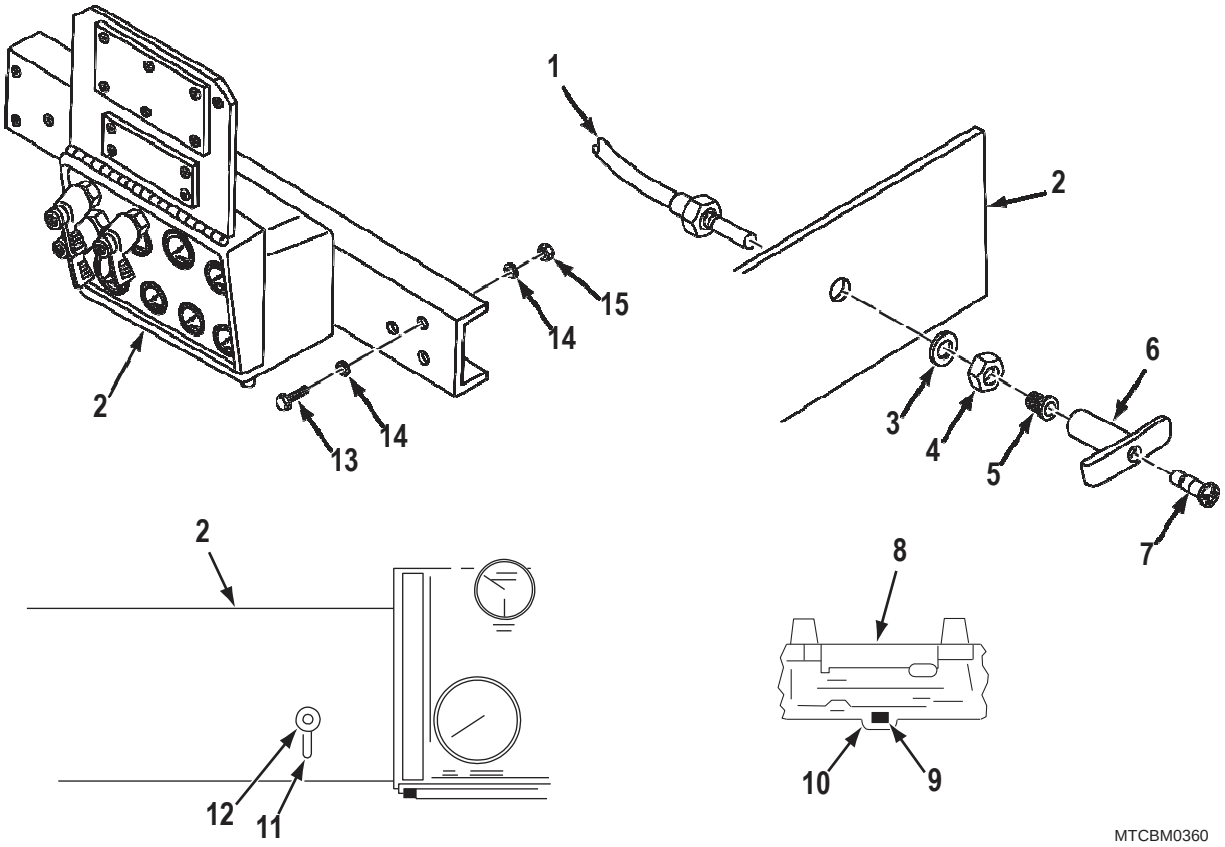


Figure 3. Throttle Cable Removal.

END OF TASK

DISASSEMBLY

NOTE

Disassembly is the same for all three switches.

1. Engine Switches (Preheater, Starter, and Engine)
   a. Remove screw (Figure 4, Item 13), washer (Figure 4, Item 14), and lever (Figure 4, Item 11) from switch (Figure 4, item 16).
   b. Remove nut (Figure 4, Item 15), lockwasher (Figure 4, Item 12), and switch (Figure 4, Item 16) from control panel (Figure 4, Item 10). Discard lockwasher (Figure 4, Item 12).
2. Oil Pressure Gage
   a. Remove adapter (Figure 4, Item 6) and coupling (Figure 4, Item 7) from oil pressure gage (Figure 4, Item 2).
   b. Remove two nuts (Figure 4, Item 8), bracket (Figure 4, Item 9), and oil pressure gage (Figure 4, Item 2) from control panel (Figure 4, Item 10).
3. Fuel Pressure Gage
   a. Remove adapter (Figure 4, Item 6) and coupling (Figure 4, Item 5) from fuel pressure gage (Figure 4, Item 1).
   b. Remove two nuts (Figure 4, Item 4), bracket (Figure 4, Item 3), and fuel pressure gage (Figure 4, Item 1) from control panel (Figure 4, Item 10).

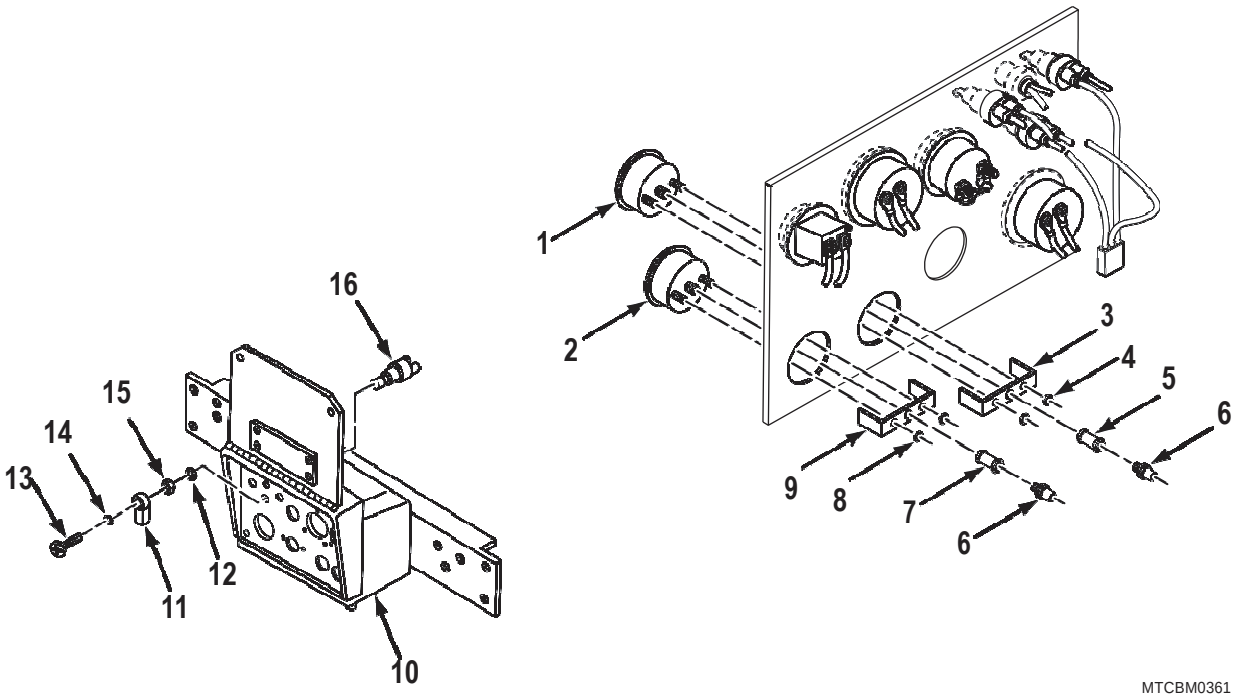


Figure 4. Oil and Fuel Pressure Gages.

DISASSEMBLY - Continued

4. Filter/Separator Gage
    a. Remove two screws (Figure 5, Item 13), washers (Figure 5, Item 23), nuts (Figure 5, Item 24), and filter/separator gage (Figure 5, Item 25) from control panel (Figure 5, Item 5).
    b. Remove two adapters (Figure 5, Item 22) and elbows (Figure 5, Item 21) from filler/separator gage (Figure 5, Item 25).
5. Pump Pressure Gage
    a. Remove adapter (Figure 5, Item 27) and snubber (Figure 5, Item 26) from pump pressure gage (Figure 5, Item 18).
    b. Remove two nuts (Figure 5, Item 19), brackets (Figure 5, Item 17), and pump pressure gage (Figure 5, Item 18) from control panel (Figure 5, Item 5).
6. Hour Meter
    a. Remove three screws (Figure 5, Item 8) and nuts (Figure 5, Item 20).
    b. Remove hour meter (Figure 5, Item 7) from control panel (Figure 5, Item 5).
7. Tachometer
    a. Remove two nuts (Figure 5, Item 10) and bracket (Figure 5, Item 11).
    b. Remove tachometer (Figure 5, Item 12) from control panel (Figure 5, Item 5).
8. Voltmeter
    a. Remove two nuts (Figure 5, Item 16) and bracket (Figure 5, Item 15).
    b. Remove voltmeter (Figure 5, Item 14) from control panel (Figure 5, Item 5).
9. Preheat Indicator Light

    Remove nut (Figure 5, Item 3), washer (Figure 5, Item 2), and light body (Figure 5, Item 1) from control panel (Figure 5, Item 5).
10. Control Panel Plate
    a. Remove four screws (Figure 5, Item 6) and self-locking nuts (Figure 5, Item 4).
    b. Remove control panel plate (Figure 5, Item 9) from control panel (Figure 5, Item 5). Discard self-locking nuts (Figure 5, Item 4).

DISASSEMBLY - Continued

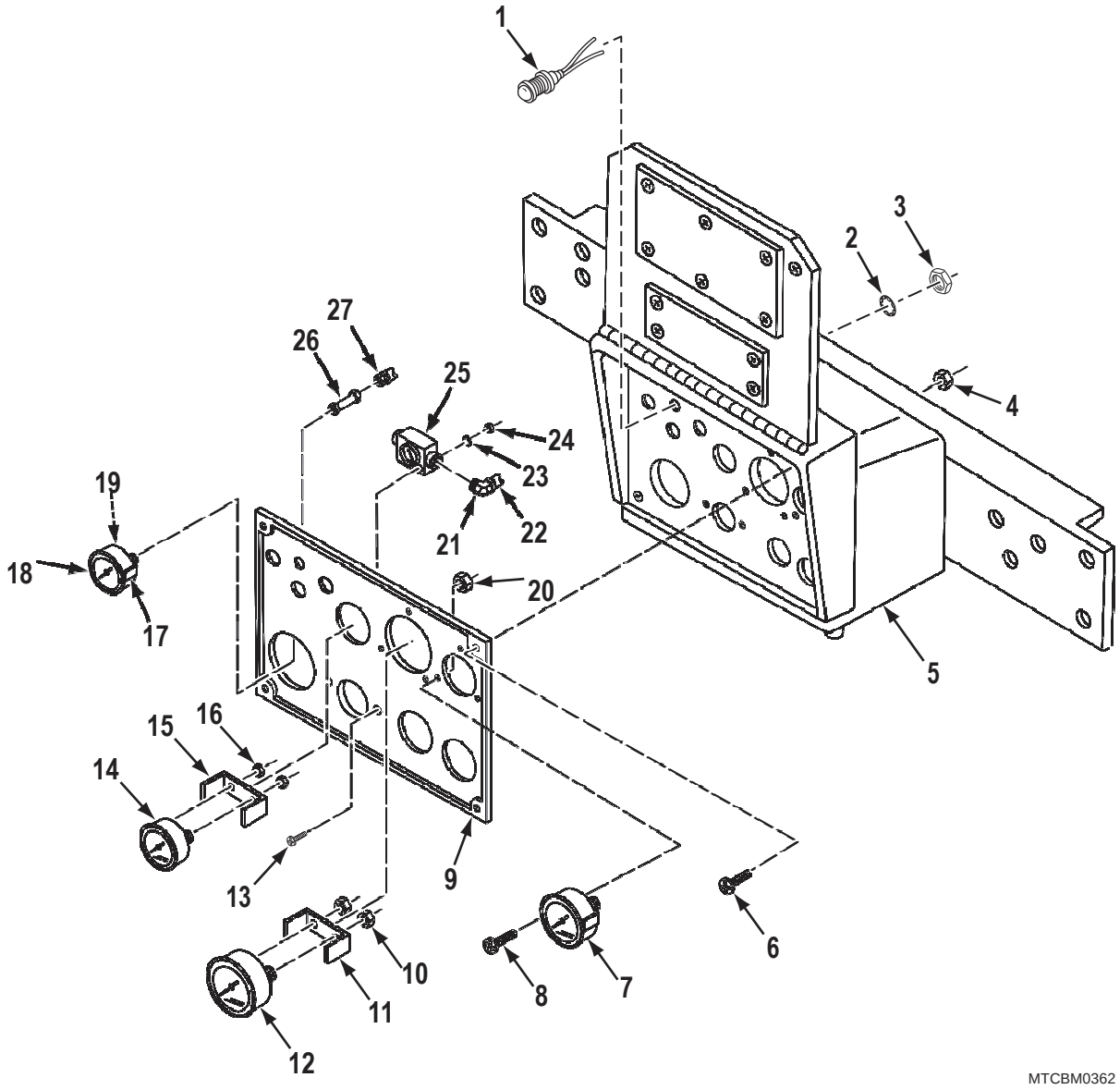


Figure 5. Gages Disassembly.

DISASSEMBLY - Continued

11. Control Panel Access Cover
    a. Remove two bumpers (Figure 6, Item 14) from access cover (Figure 6, Item 1).
    b. Remove two screws (Figure 6, Item 16), self-locking nuts (Figure 6, Item 2), and wire rope (Figure 6, Item 15) from control panel (Figure 6, Item 13). Discard self-locking nuts (Figure 6, Item 2).
    c. Remove six screws (Figure 6, Item 12), self-locking nuts (Figure 6, Item 11), and access cover (Figure 6, Item 1) from hinge (Figure 6, Item 4). Discard self-locking nuts (Figure 6, Item 11).
    d. Remove six screws (Figure 6, Item 10), self-locking nuts (Figure 6, Item 6), two springs (Figure 6, Item 5), and hinge (Figure 6, Item 4) from bracket (Figure 6, Item 3). Discard self-locking nuts (Figure 6, Item 6).
    e. Remove four screws (Figure 6, Item 7), washers (Figure 6, Item 8), self-locking nuts (Figure 6, Item 9), and bracket (Figure 6, Item 3) from control panel (Figure 6, Item 13). Discard self-locking nuts (Figure 6, Item 9).

END OF TASK

INSPECTION

Visually check instruments for broken glass, damaged terminals, corrosion, and damage to cases and capillary tubes. Check wiring for broken or damaged insulation and for broken wires. Check couplings and lines to pump, filter/separator, fuel, and oil gages for damage.

END OF TASK

ASSEMBLY

1. Control Panel Access Cover
    a. Install bracket (Figure 6, Item 3) on control panel (Figure 6, Item 13) with four screws (Figure 6, Item 7), washers (Figure 6, Item 8), and new self-locking nuts (Figure 6, Item 9).
    b. Install hinge (Figure 6, Item 4) and two springs (Figure 6, Item 5) on bracket (Figure 6, Item 3) with six screws (Figure 6, Item 10) and new self-locking nuts (Figure 6, Item 6).
    c. Install access cover (Figure 6, Item 1) on hinge (Figure 6, Item 4) with six screws (Figure 6, Item 12) and new self-locking nuts (Figure 6, Item 11).
    d. Install wire rope (Figure 6, Item 15) on control panel (Figure 6, Item 13) with two screws (Figure 6, Item 16) and new self-locking nuts (Figure 6, Item 2).
    e. Install two bumpers (Figure 6, Item 14) on access cover (Figure 6, Item 1).

ASSEMBLY - Continued

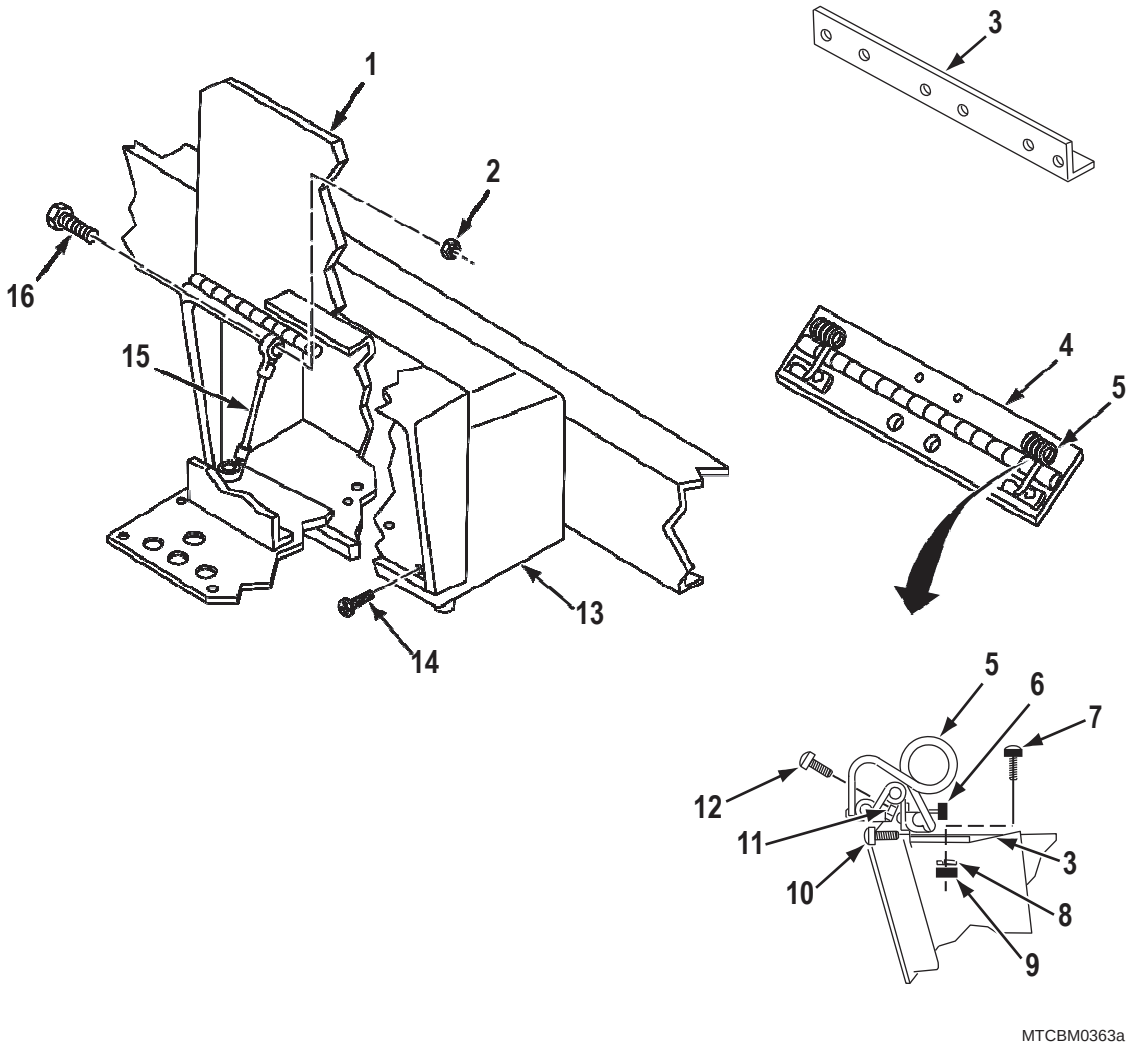


Figure 6. Control Panel Access Cover.

ASSEMBLY - Continued

2. Control Panel Plate
   a. Install control panel plate (Figure 7, Item 9) on control panel (Figure 7, Item 5).
   b. Secure control panel plate (Figure 7, Item 9) using four screws (Figure 7, Item 6), and new self-locking nuts (Figure 7, Item 4).
3. Preheat Indicator Light

   Install light body (Figure 7, Item 1), washer (Figure 7, Item 2), and nut (Figure 7, Item 3) on control panel (Figure 7, Item 5).
4. Voltmeter

   Install voltmeter (Figure 7, Item 14) on control panel (Figure 7, Item 5) with bracket (Figure 7, Item 15) and two nuts (Figure 7, Item 16).
5. Tachometer
   a. Install tachometer (Figure 7, Item 12) on control panel (Figure 7, Item 5) with bracket (Figure 7, Item 11) and two nuts (Figure 7, Item 10).
   b. Fabricate two electrical lead assemblies, 12275404 and 12275540.
6. Hour Meter
   a. Install hour meter (Figure 7, Item 8) on control panel (Figure 7, Item 5).
   b. Secure hour meter (Figure 7, Item 7) using three screws (Figure 7, Item 8), and nuts (Figure 7, Item 20).
7. Pump Pressure Gage
   a. Install pump pressure gage (Figure 7, Item 18) on control panel (Figure 7, Item 5) with two brackets (Figure 7, Item 17) and nuts (Figure 7, Item 19).
   b. Install snubber (Figure 7, Item 26) and adapter (Figure 7, Item 27) on pump pressure gage (Figure 7, Item 18).
8. Filter/Separator Gage
   a. Install two elbows (Figure 7, Item 21) and adapters (Figure 7, Item 22) on fitter/separator gage (Figure 7, Item 25).
   b. Install filter/separator gage (Figure 7, Item 25) on control panel (Figure 7, Item 5) with two screws (Figure 7, Item 13), washers (Figure 7, Item 23), and nuts (Figure 7, Item 24).

ASSEMBLY - Continued

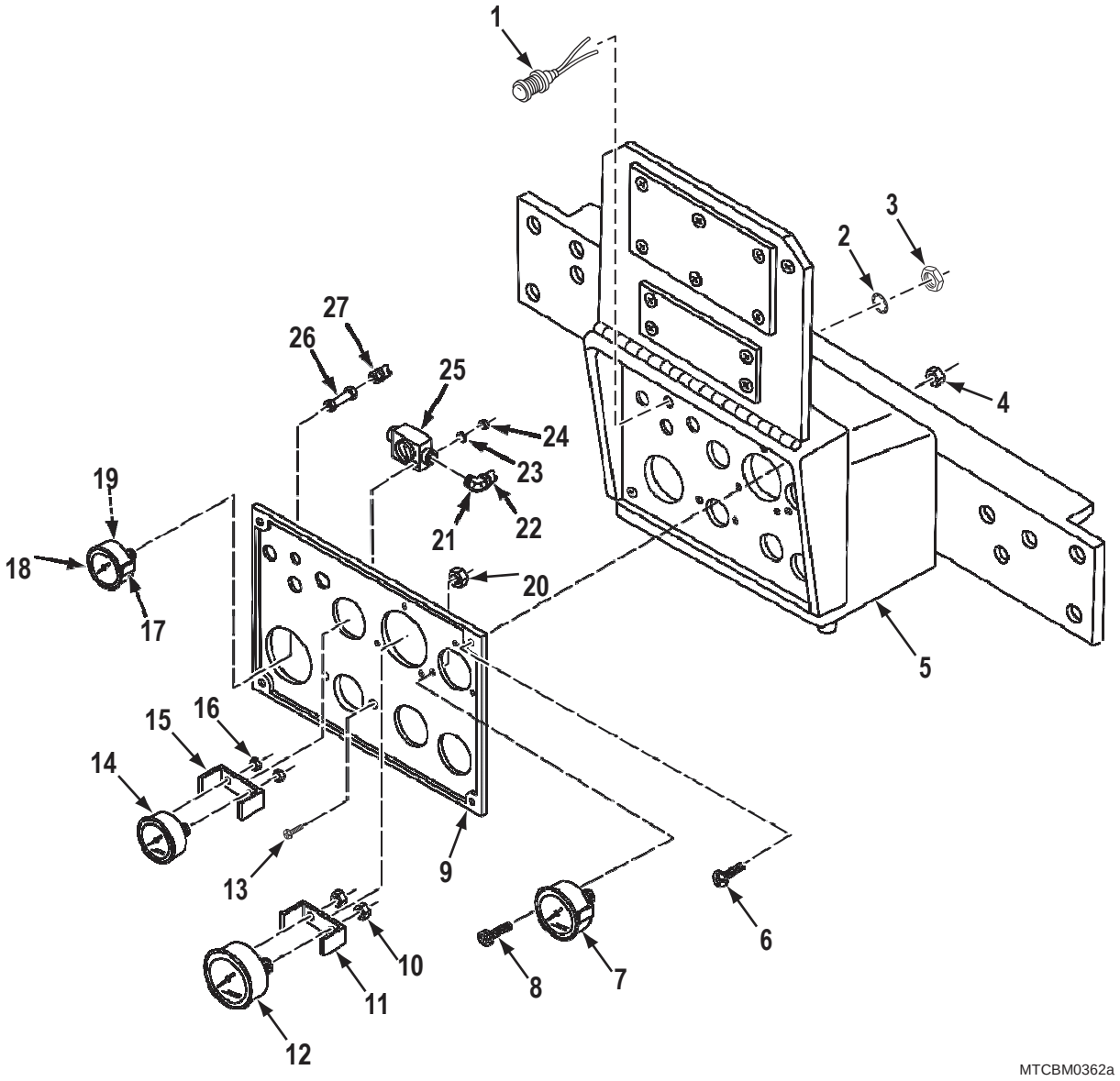


Figure 7. Gages Assembly.

ASSEMBLY - Continued

NOTE

Semitrailers equipped with Lombardini engine do not have fuel pressure gage.

9. Fuel Pressure Gage
   a. Install fuel pressure gage (Figure 8, Item 1) on control panel (Figure 8, Item 10) with bracket (Figure 8, Item 3) and two nuts (Figure 8, Item 4).
   b. Install coupling (Figure 8, Item 5) and adapter (Figure 8, Item 6) on fuel pressure gage (Figure 8, Item 1).
10. Oil Pressure Gage
   a. Install oil pressure gage (Figure 8, Item 2) on control panel (Figure 8, Item 10) with bracket (Figure 8, Item 9) and two nuts (Figure 8, Item 8).
   b. Install coupling (Figure 8, Item 7) and adapter (Figure 8, Item 6) on oil pressure gage (Figure 8, Item 2).

NOTE

Assembly is the same for all three switches.

11. Engine Switches (Preheater, Starter, and Engine)
   a. Install switch (Figure 8, Item 16) on control panel (Figure 8, Item 10) with nut (Figure 8, Item 15) and new lockwasher (Figure 8, Item 12).
   b. Install lever (Figure 8, Item 11) on switch (Figure 8, Item 16) with screw (Figure 8, Item 13) and washer (Figure 8, Item 14).

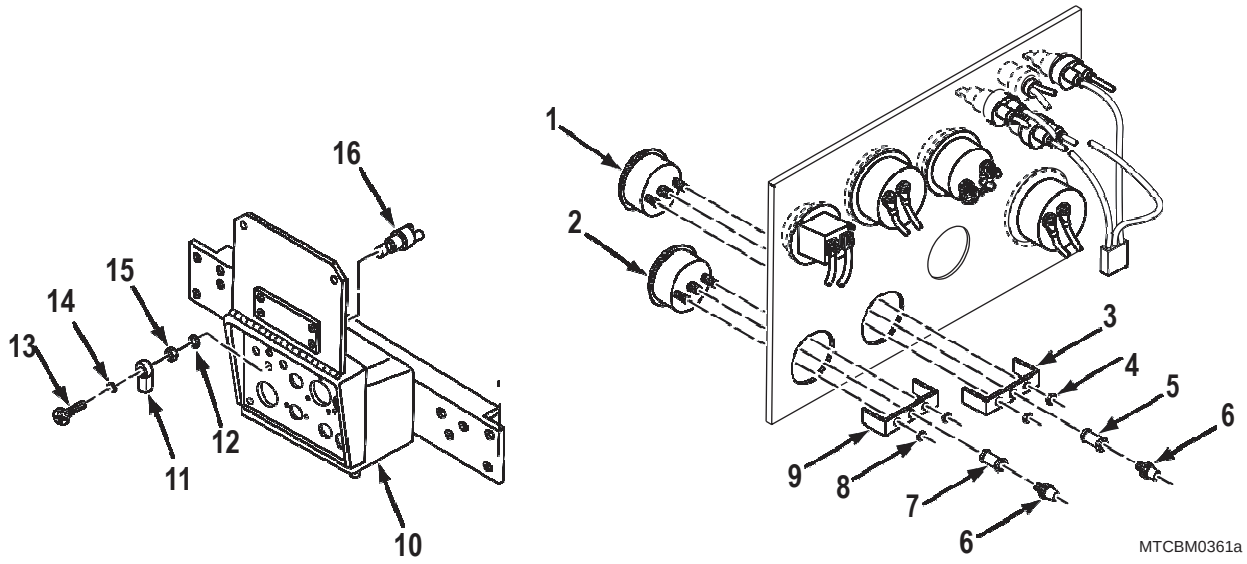


Figure 8. Gages and Switches Assembly.

END OF TASK

INSTALLATION

1. Install engine control panel (Figure 9, Item 2) on semitrailer with four screws (Figure 9, Item 13), eight washers (Figure 9, Item 14), and four new self-locking nuts (Figure 9, Item 15).
2. Install valve (Figure 9, Item 8) on channel of control panel (Figure 9, Item 2) with washer (Figure 9, Item 9), nut (Figure 9, Item 10), lever (Figure 9, Item 11), and screw (Figure 9, Item 12).
3. Install throttle cable (Figure 9, Item 1) on channel of control panel (Figure 9, Item 2) with washer (Figure 9, Item 3) and jamnut (Figure 9, Item 4).
4. Install handle (Figure 9, Item 6) on throttle cable (Figure 9, Item 1) with packing nut (Figure 9, Item 5) and screw (Figure 9, Item 7).

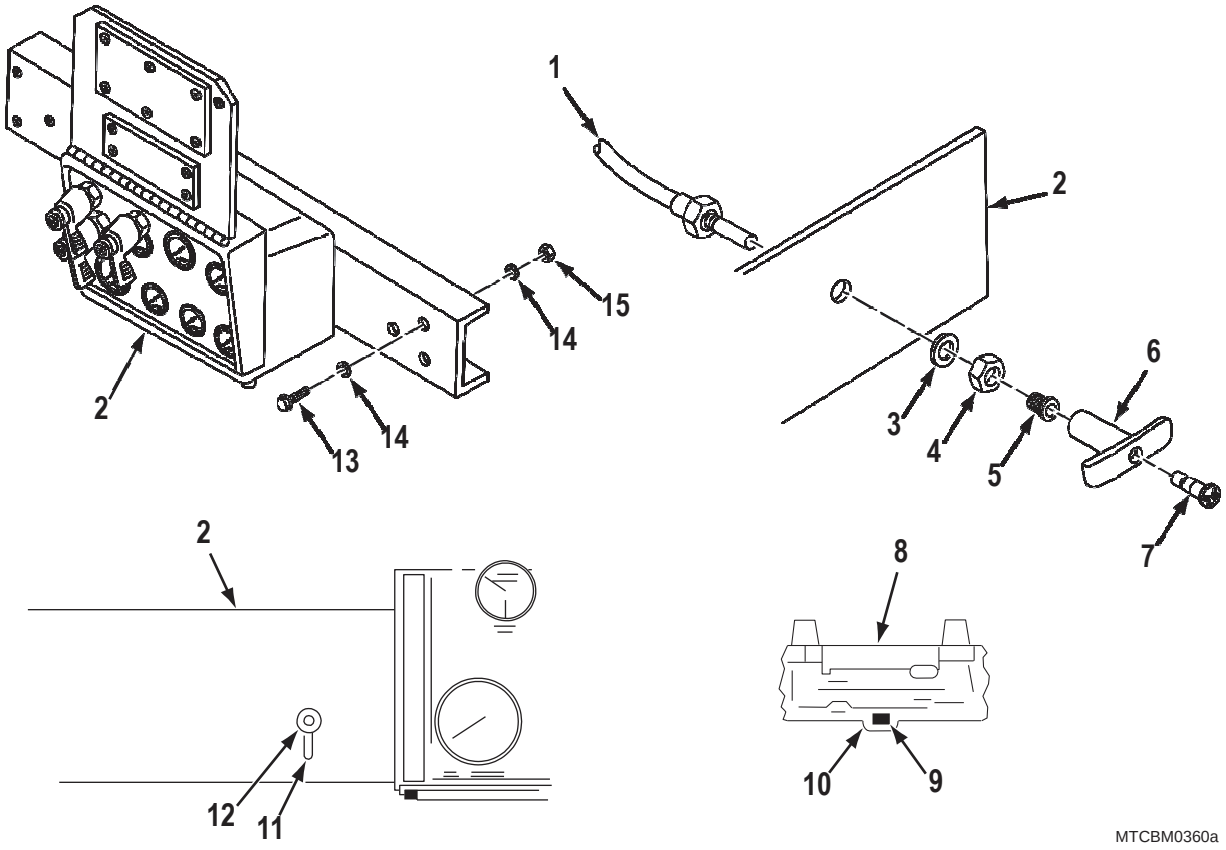


Figure 9. Throttle Cable Installation.

INSTALLATION - Continued

NOTE

Semitrailers equipped with Lombardini engine do not have fuel pressure gage.

5. Connect fuel/oil lines (Figure 10, Item 12) to adapters (Figure 10, Item 13) on oil pressure gage (Figure 10, Item 14), fuel pressure gage (Figure 10, Item 15), filter/separater gage (Figure 10, Item 17), and pump pressure gage (Figure 10, Item 16).
6. Install control panel light conduit adapter (Figure 10, Item 18) on side of control panel (Figure 10, Item 2).
7. Install control panel harness conduit adapter (Figure 10, Item 1) on back of control panel (Figure 10, Item 2).
8. Connect electrical leads (Figure 10, Item 6), jumper assemblies (Figure 10, Item 4), and electrical components (Figure 10, Item 3) to control panel wiring harness (Figure 10, Item 5).
9. Install fastener (Figure 10, Item 9) on control panel (Figure 10, Item 2) with two screws (Figure 10, Item 8) and new self-locking nuts (Figure 10, Item 10).
10. Close control panel (Figure 10, Item 2) and install six screws (Figure 10, Item 11).
11. Close control panel cover (Figure 10, Item 7) and secure with fastener (Figure 10, Item 9).

INSTALLATION - Continued

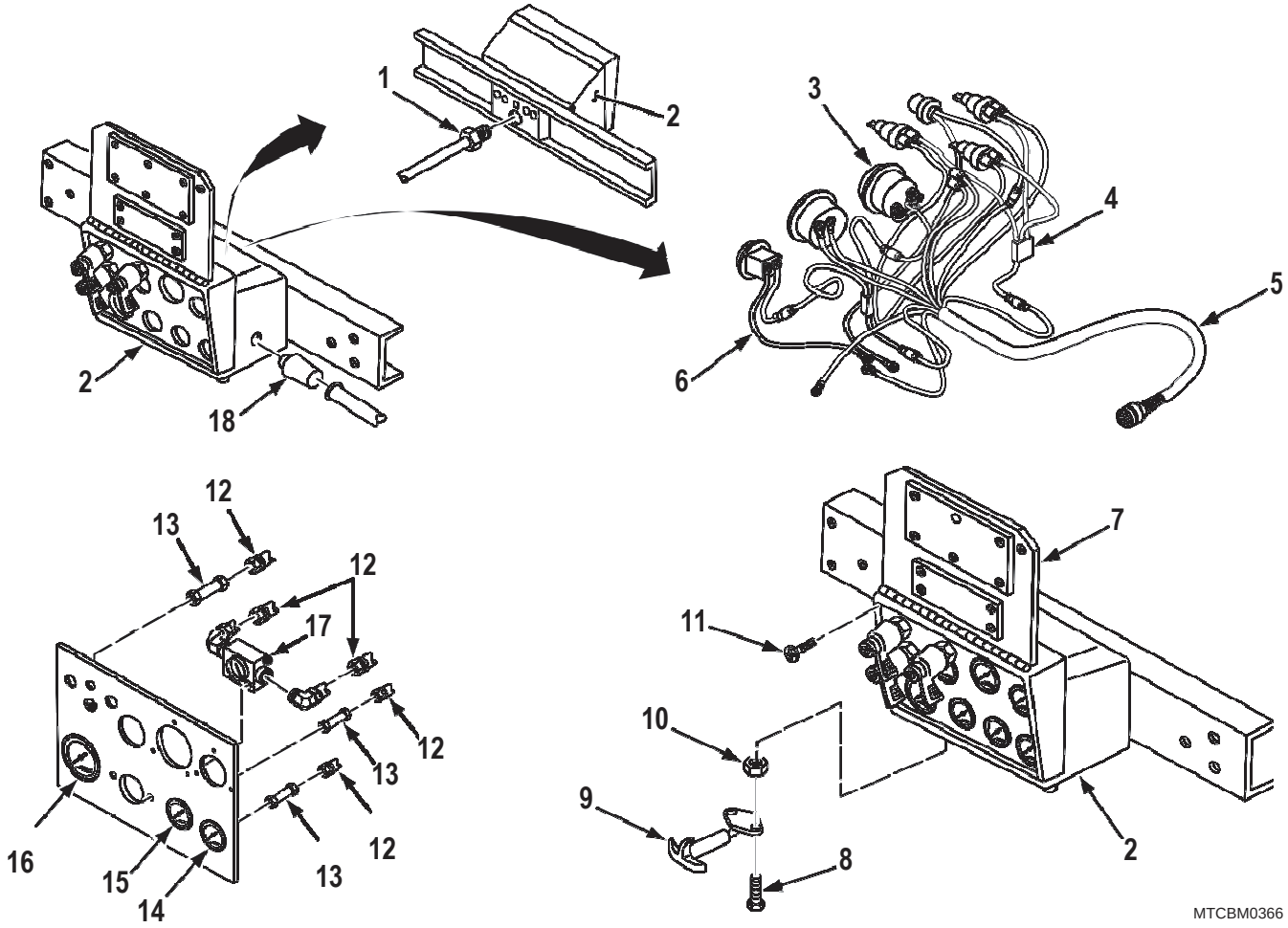


Figure 10. Engine Control Panel Installation.

END OF TASK

FOLLOW ON TASK

Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
OIL PRESSURE SWITCH AND HOSE ASSEMBLY REPLACEMENT (ONAN)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Tape, Antiseize (WP 0293, Table 1, Item 29)
Washer, Lock (WP 0295, Table 1, Item 190)

Equipment Condition
Semitrailer uncoupled (WP 0007)

Equipment Condition (cont.)
Negative battery cables disconnected (WP 0210)
Engine door panel removed (WP 0215)
Primary fuel filter removed (WP 0210)
Oil filter removed (WP 0179)

WARNING

When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove two screws (Figure 1, Item 11) and electrical connections (Figure 1, Item 1) from oil pressure switch (Figure 1, Item 2).
2. Remove oil pressure switch (Figure 1, Item 2) from adapter fitting (Figure 1, Item 3).
3. Disconnect hose assembly (Figure 1, Item 5) from upper elbow fitting (Figure 1, Item 7).
4. Remove upper elbow fitting (Figure 1, Item 7) from adapter fitting (Figure 1, Item 3).
5. Remove adapter fitting (Figure 1, Item 3), two flatwashers (Figure 1, Item 4), lockwasher (Figure 1, Item 9), and nut (Figure 1, Item 8) from engine box (Figure 1, Item 10). Discard lockwasher (Figure 1, Item 9).
6. Remove lower elbow fitting (Figure 1, Item 6) from engine.

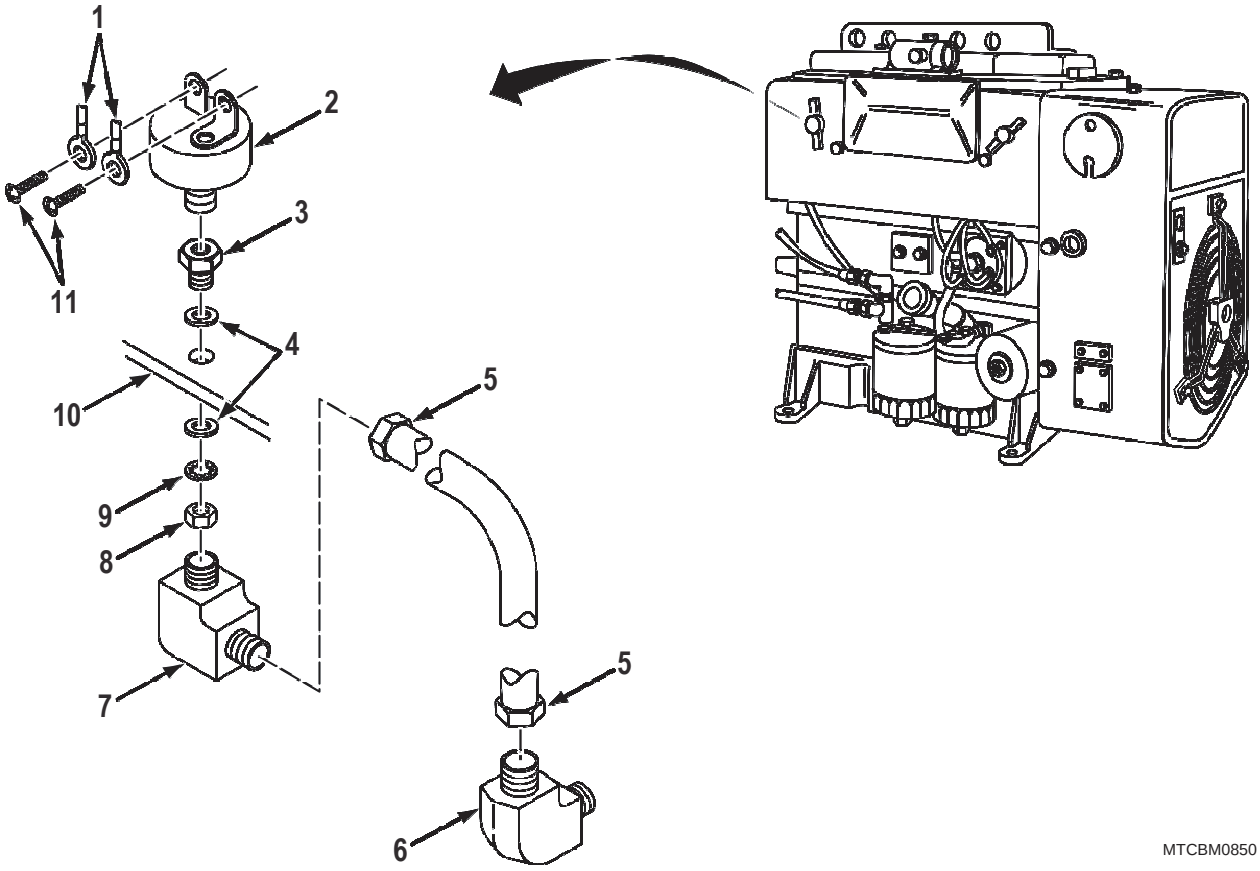


Figure 1. Oil Pressure Switch, Lower Hose Assembly, and Fitting Removal.

END OF TASK

INSPECTION

1. Inspect elbow fitting (Figure 1, Item 6) for damage. Replace if damaged.
2. Inspect hose assembly (Figure 1, Item 5) for damage. Replace hose assembly (Figure 1, Item 5) if damaged.

END OF TASK

INSTALLATION

NOTE

If hose assembly is replaced, it is necessary to assemble hose. Assemble hose per (WP 0285).

1. Apply teflon tape to threads of lower elbow fitting (Figure 2, Item 6) and install on engine.
2. Install lower end of hose assembly (Figure 2, Item 5) to lower elbow fitting (Figure 2, Item 6).
3. Install adapter fitting (Figure 2, Item 3) to engine box (Figure 2, Item 10) with two flatwashers (Figure 2, Item 4), new lockwasher (Figure 2, Item 9), and nut (Figure 2, Item 8).
4. Apply teflon tape to threads of upper elbow fitting (Figure 2, Item 7) and install on adapter fitting (Figure 2, Item 3).
5. Install upper end of hose assembly (Figure 2, Item 5) to upper elbow fitting (Figure 2, Item 7).
6. Apply teflon tape to threads of oil pressure switch (Figure 2, Item 2) and install on adapter fitting (Figure 2, Item 3).
7. Install electrical connections (Figure 2, Item 1) to oil pressure switch (Figure 2, Item 2) with two screws (Figure 2, Item 11).

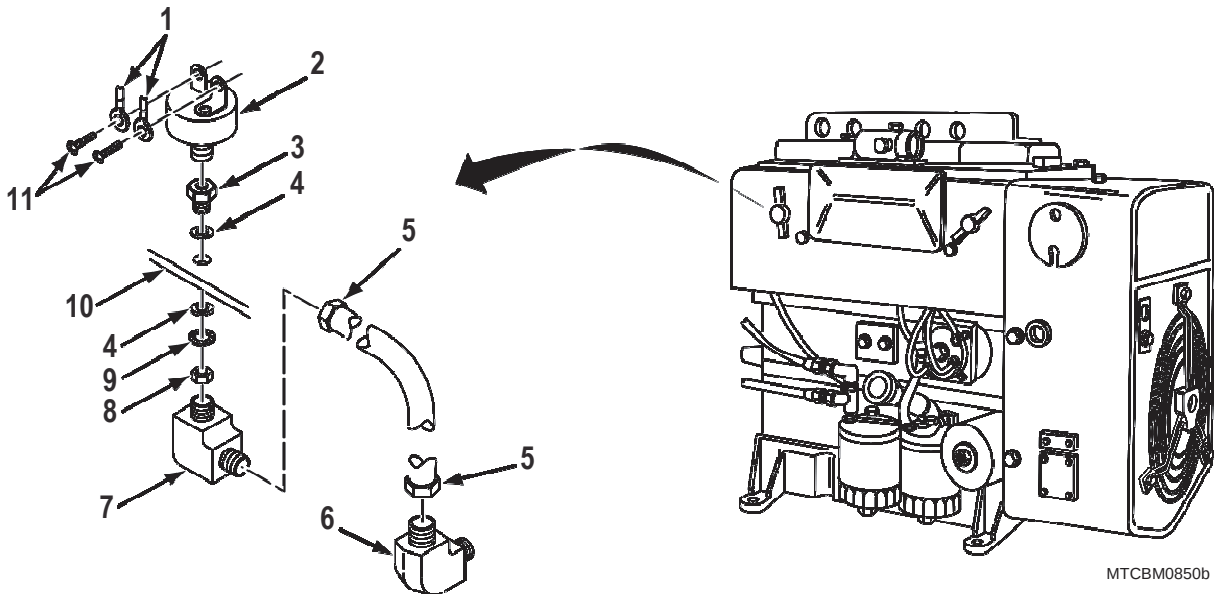


Figure 2. Oil Pressure Switch, Lower Hose Assembly, and Fitting Installation.

END OF TASK

FOLLOW ON TASK

1. Install oil filter (WP 0179).
2. Install primary fuel filter (WP 0210).
3. Install engine door panel (WP 0215).
4. Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
VAPOR RECOVERY SYSTEM MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
Gasket (WP 0295, Table 1, Item 21)
Gasket (WP 0295, Table 1, Item 36)
Gasket Qty: (2) (WP 0295, Table 1, Item 37)
Gasket Qty: (2) (WP 0295, Table 1, Item 136)
Nut, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 162)
Nut, Self-Locking
Qty: (12) (WP 0295, Table 1, Item 164)
Nut, Self-Locking
Qty: (10) (WP 0295, Table 1, Item 165)
Nut, Self-Locking
Qty: (8) (WP 0295, Table 1, Item 166)
Petrolatum (WP 0293, Table 1, Item 19)
Seal (WP 0295, Table 1, Item 16)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

DISASSEMBLY OF HOOD AND HOSE

1. Loosen clamp (Figure 1, Item 5) on hood (Figure 1, Item 2).
2. Loosen hose clamp (Figure 1, Item 6). Slide off clamp (Figure 1, Item 5), hose (Figure 1, Item 7), and hood (Figure 1, Item 2), as a unit, from semitrailer.
3. Loosen two hose clamps (Figure 1, Items 1 and 8) and remove hose (Figure 1, Item 7) and pipe (Figure 1, Item 9) from hood (Figure 1, Item 2).
4. Loosen clamp (Figure 1, Item 4) and remove plug (Figure 1, Item 3) from hood (Figure 1, Item 2).

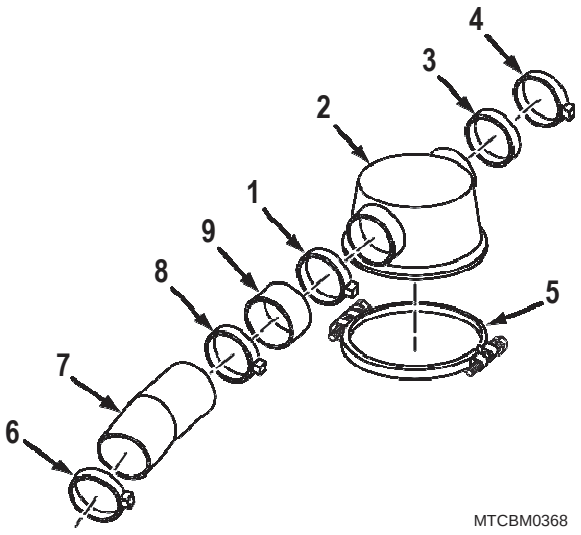


Figure 1. Hood and Hose Disassembly.

DISASSEMBLY OF HOOD AND HOSE - Continued

5. Remove four screws (Figure 2, Item 9), adapter (Figure 2, Item 11), and gasket (Figure 2, Item 10) from semitrailer. Discard gasket (Figure 2, Item 10).
6. Remove six screws (Figure 2, Item 16), self-locking nuts (Figure 2, Item 13), adapter (Figure 2, Item 14), and gasket (Figure 2, Item 15) from semitrailer. Discard self-locking nuts (Figure 2, Item 13) and gasket (Figure 2, Item 15).

END OF TASK

ASSEMBLY OF HOOD AND HOSE

1. Install six screws (Figure 2, Item 16), new self-locking nuts (Figure 2, Item 13), adapter (Figure 2, Item 14), and new gasket (Figure 2, Item 15) on semitrailer.
2. Install four screws (Figure 2, Item 9), adapter (Figure 2, Item 11), and new gasket (Figure 2, Item 10) on semitrailer.
3. Install plug (Figure 2, Item 3) and clamp (Figure 2, Item 2) on hood (Figure 2, Item 4), and tighten clamp (Figure 2, Item 2).
4. Install pipe (Figure 2, Item 7), hose (Figure 2, Item 1), and two hose clamps (Figure 2, Items 6 and 8) on hood (Figure 2, Item 4), and tighten hose clamps (Figure 2, Items 6 and 8).
5. Install clamp (Figure 2, Item 5), hood (Figure 2, Item 4), and hose (Figure 2, Item 1), as a unit on semitrailer. Tighten hose clamp (Figure 2, Item 12).
6. Tighten clamp (Figure 2, Item 5) on hood (Figure 2, Item 4).

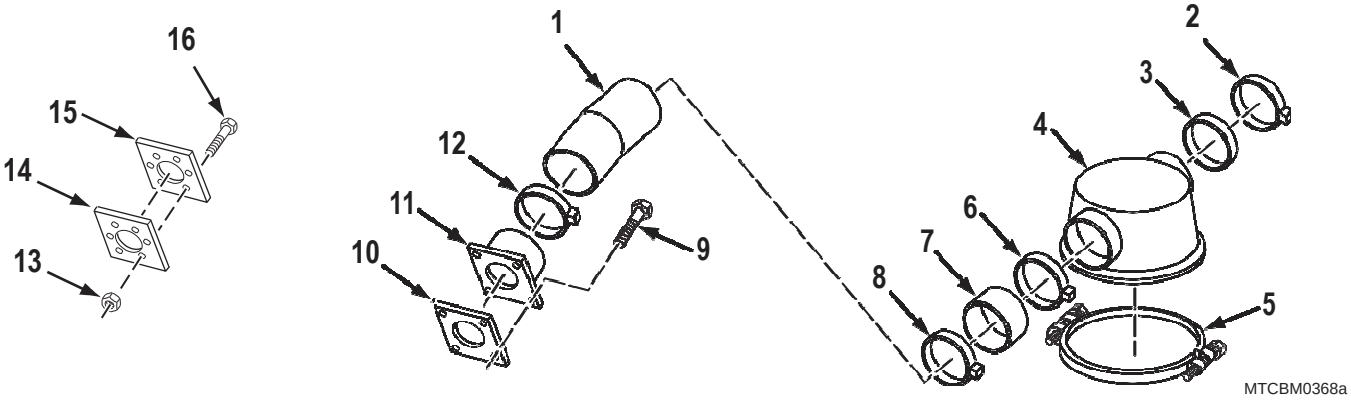


Figure 2. Hood and Hose Assembly.

END OF TASK

DISASSEMBLY OF PIPING

1. Remove coupling (Figure 3, Item 10), screen (Figure 3, Item 11), and gasket (Figure 3, Item 12) from coupling (Figure 3, Item 13). Discard gasket (Figure 3, Item 12).
2. Remove two bolts (Figure 3, Item 2), coupling (Figure 3, Item 3), and seal (Figure 3, Item 4) from elbow (Figure 3, Item 1). Discard seal (Figure 3, Item 4).

NOTE

Provide support for pipe assembly so it will not fall.

3. Remove four self-locking nuts (Figure 3, Item 14) and washers (Figure 3, Item 15), two U-bolts (Figure 3, Item 9), and pipe assembly (Figure 3, Item 17) from bracket (Figure 3, Item 16). Discard self-locking nuts (Figure 3, Item 14).
4. Remove coupling (Figure 3, Item 13) from pipe assembly (Figure 3, Item 17).
5. Remove eight screws (Figure 3, Item 8), self-locking nuts (Figure 3, Item 5), vent (Figure 3, Item 7), and gasket (Figure 3, Item 6) from semitrailer. Discard gasket (Figure 3, Item 6) and self-locking nuts (Figure 3, Item 5).

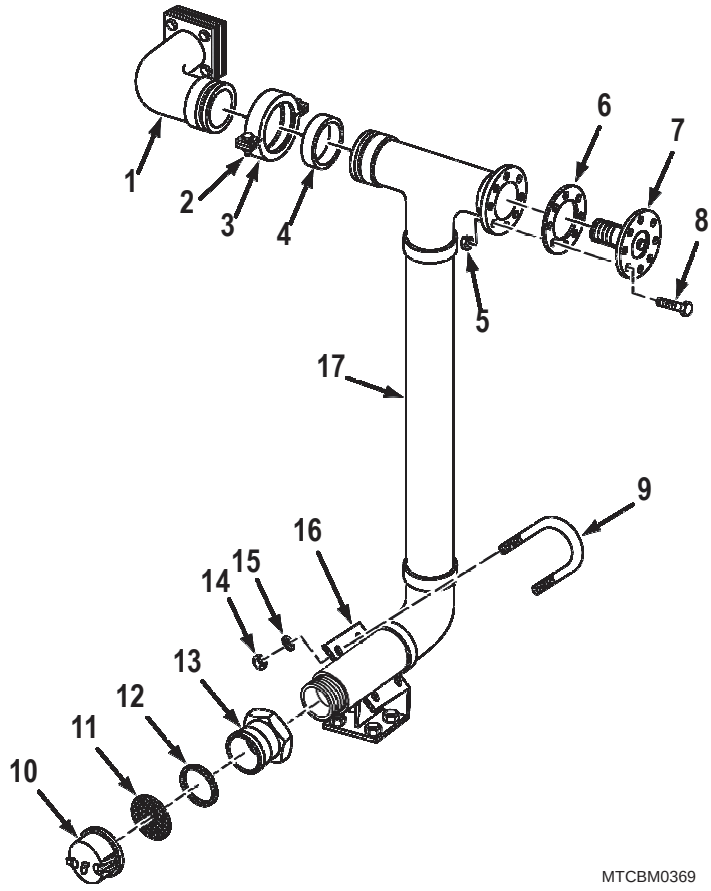


Figure 3. Piping Disassembly.

DISASSEMBLY OF PIPING - Continued

6. Remove four screws (Figure 4, Item 1), elbow (Figure 4, Item 26), and gasket (Figure 4, Item 2) from adapter (Figure 4, Item 3). Discard gasket (Figure 4, Item 2).
7. Remove six screws (Figure 4, Item 6), self-locking nuts (Figure 4, Item 5), adapter (Figure 4, Item 3), and gasket (Figure 4, Item 4) from semitrailer. Discard self-locking nuts (Figure 4, Item 5) and gasket (Figure 4, Item 4).
8. Remove four screws (Figure 4, Item 16), self-locking nuts (Figure 4, Item 17), eight washers (Figure 4, Item 15), and bracket (Figure 4, Item 12) from semitrailer. Discard self-locking nuts (Figure 4, Item 17).

END OF TASK

ASSEMBLY OF PIPING

1. Install four screws (Figure 4, Item 16), new self-locking nuts (Figure 4, Item 17), eight washers (Figure 4, Item 15), and bracket (Figure 4, Item 12) on semitrailer.
2. Install six screws (Figure 4, Item 6), new self-locking nuts (Figure 4, Item 5), adapter (Figure 4, Item 3), and new gasket (Figure 4, Item 4) on semitrailer.
3. Install four screws (Figure 4, Item 1), elbow (Figure 4, Item 26), and new gasket (Figure 4, Item 2) on adapter (Figure 4, Item 3).
4. Install eight screws (Figure 4, Item 9), new self-locking nuts (Figure 4, Item 10), vent (Figure 4, Item 8), and new gasket (Figure 4, Item 7) on semitrailer.
5. Install coupling (Figure 4, Item 21) on pipe assembly (Figure 4, Item 22).
6. Install pipe assembly (Figure 4, Item 22), two U-bolts (Figure 4, Item 11), four new self-locking nuts (Figure 4, Item 14) and washers (Figure 4, Item 13) on bracket (Figure 4, Item 12).

NOTE

Lubricate seal with petrolatum.

7. Install new seal (Figure 4, Item 23) on elbow (Figure 4, Item 26). Make sure gasket lip does not overhang end of elbow.
8. Align pipe assembly (Figure 4, Item 22) and elbow (Figure 4, Item 26). Slide seal (Figure 4, Item 23) into position, centered between the grooves on each end of pipe assembly and elbow.
9. Install coupling (Figure 4, Item 24) on elbow (Figure 4, Item 26) with two bolts (Figure 4, Item 25).
10. Install new gasket (Figure 4, Item 20), screen (Figure 4, Item 19), and coupling (Figure 4, Item 18) on coupling (Figure 4, Item 21).
11. Torque two bolts (Figure 4, Item 25) between 104-116 lb ft (141-157 N·m).

ASSEMBLY OF PIPING - Continued

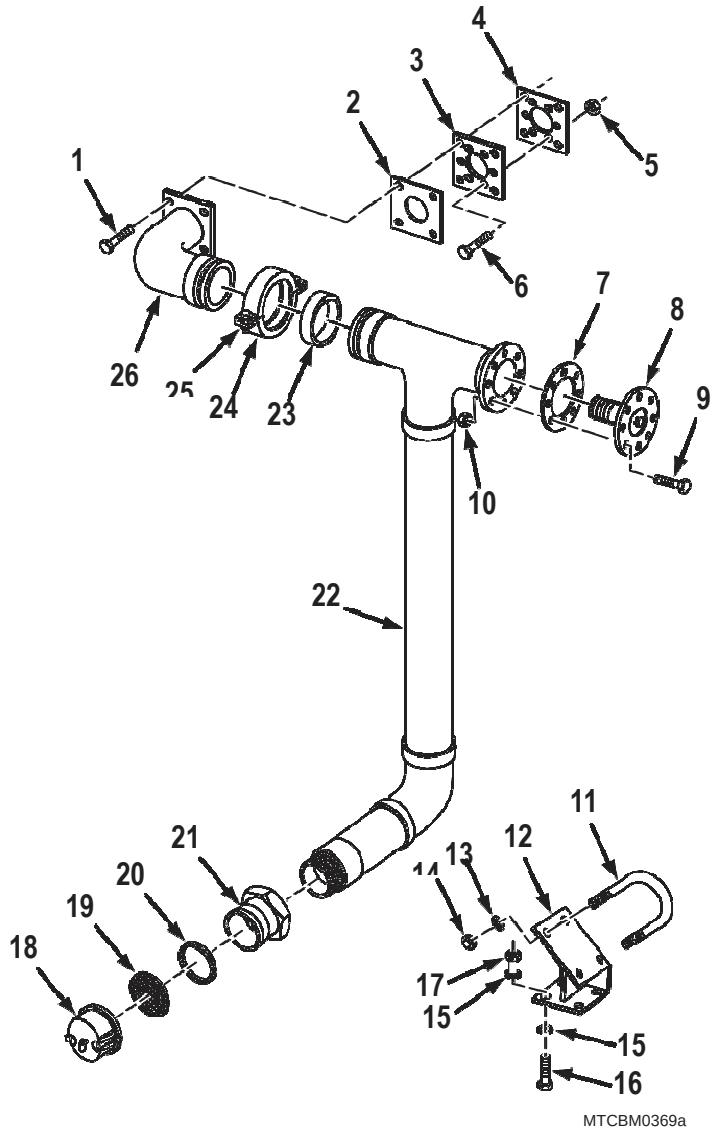


Figure 4. Piping Assembly.

END OF TASK

DISASSEMBLY OF GROUND RECEPTACLE

1. Remove screw (Figure 5, Item 2), self-locking nut (Figure 5, Item 5), and ground lead (Figure 5, Item 6) of ground receptacle (Figure 5, Item 4) from bracket (Figure 5, Item 7). Discard self-locking nut (Figure 5, Item 5).
2. Remove two screws (Figure 5, Item 3), self-locking nuts (Figure 5, Item 1), and receptacle (Figure 5, Item 4) from bracket (Figure 5, Item 7). Discard self-locking nuts (Figure 5, Item 1).
3. Remove screw (Figure 5, Item 2), self-locking nut (Figure 5, Item 5), and bracket (Figure 5, Item 7) from semitrailer. Discard self-locking nut (Figure 5, Item 5).

END OF TASK

ASSEMBLY OF GROUND RECEPTACLE

1. Install bracket (Figure 5, Item 7) on semitrailer with screw (Figure 5, Item 2) and new self-locking nut (Figure 5, Item 5).
2. Install receptacle (Figure 5, Item 4) on bracket (Figure 5, Item 7) with two screws (Figure 5, Item 3) and new self-locking nuts (Figure 5, Item 1).
3. Install ground lead (Figure 5, Item 6) of ground receptacle (Figure 5, Item 4) on bracket (Figure 5, Item 7) with screw (Figure 5, Item 2) and new self-locking nut (Figure 5, Item 5).

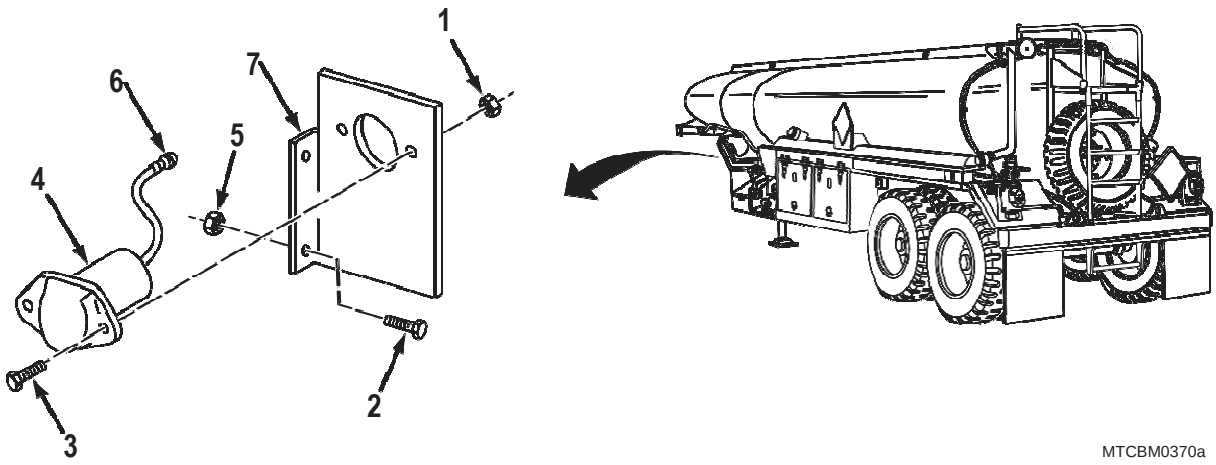


Figure 5. Ground Receptacle Replacement.

END OF TASK

FOLLOW ON TASK

Disconnect ground (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
VAPOR INTEGRITY TEST

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
DOT 49CF180.407
DOT 49CFR180.409
DOT 49CFR180.415

References (cont.)
TB ORD 1031
WP 0229
WP 0246

Equipment Condition
Semitrailer uncoupled (WP 0007)
Semitrailer bonded and grounded (WP 0008)

NOTE

- Perform EPA (Environmental Protection Agency) Method 27 for the leak test; this procedure tests tankers to MC306 and DOT 406 Standards. This will be performed to California EPA standards.
- Testing personnel must be registered with DOT in accordance with DOT regulation 49CFR180.409.

PRESSURE TEST PREPARATION

WARNING

- Use extreme caution when walking or working on the top of semitrailer. Walkway can become slippery due to moisture or fuel spillage. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Before performing the pressure or vacuum test, the semitrailer must be grounded to an approved (earth) ground and must be safe to proceed. Failure to follow this warning may cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Make sure tank and piping system are free of all liquid and that tank is purged of all vapor (implement the cleaning procedures, as applicable, refer to TB ORD 1031). Failure to follow this warning may cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

PRESSURE TEST PREPARATION - Continued

CAUTION

- Monometer with a precision of 0.1 in. H2O must be used for the vapor recovery test. Failure to use a monometer of this precision will not provide accurate results and may result in equipment leaks and possible failure. Failure to comply may result in damage to, or destruction of, equipment or mission.
- Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

- Select an area with minimum temperature changes, which directly affect pressure readings. Do not perform the pressure test in direct sunlight.
- Visually inspect outside of tank and all associated piping. Look for stained areas that indicate obvious leakage. Repair obvious leaks prior to performing pressure test. Inspect discharge valve to ensure leak-free operation.
- Make sure test equipment gages are set to zero by turning adjusting screw on each gage.

1. Open manhole cover (Figure 1, Item 7), install test plate (Figure 1, Item 2), and fasten securely.
2. Ensure clamp ring (Figure 1, Item 3) for manhole cover (Figure 1, Item 7) is fastened securely.
3. Ensure both 3 in. (7.62 cm) cleanout caps (Figure 1, Item 1) are fastened securely.
4. Ensure vapor vent valve (Figure 1, Item 4), hood clamp (Figure 1, Item 5), and hose clamps (Figure 1, Item 6) are fastened securely.

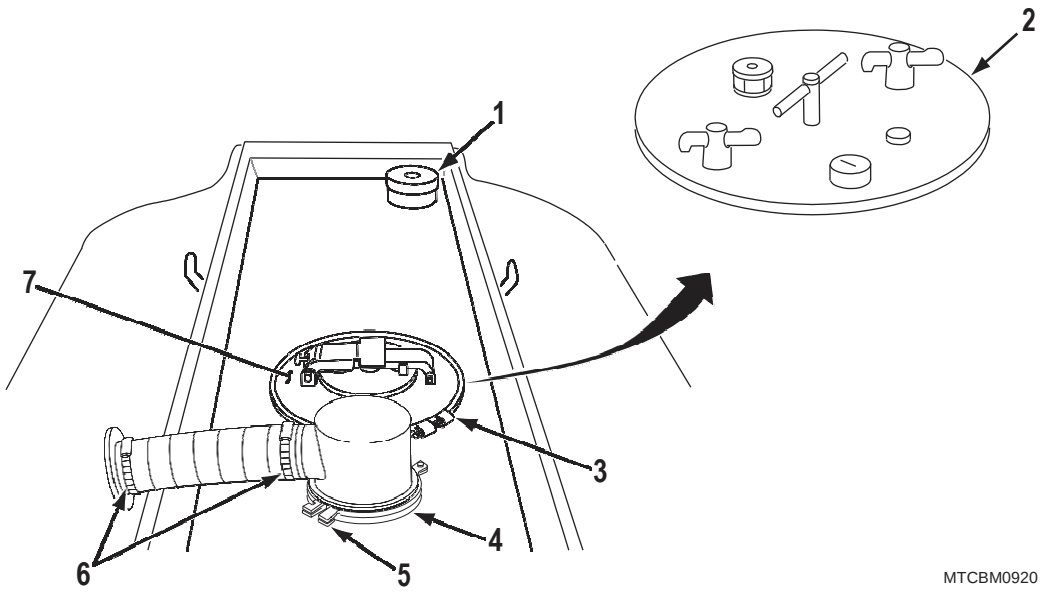


Figure 1. Manhole Cover and Vapor Vent Assembly.

PRESSURE TEST PREPARATION - Continued

5. Remove dust cap (Figure 2, Item 1) from vapor vent line (Figure 2, Item 2).
6. Attach coupling assembly (Figure 2, Item 3) to vapor vent line (Figure 2, Item 2).
7. Attach regulator assembly (Figure 2, Item 5) to coupling assembly (Figure 2, Item 3) using two hose assemblies (Figure 2, Item 4).

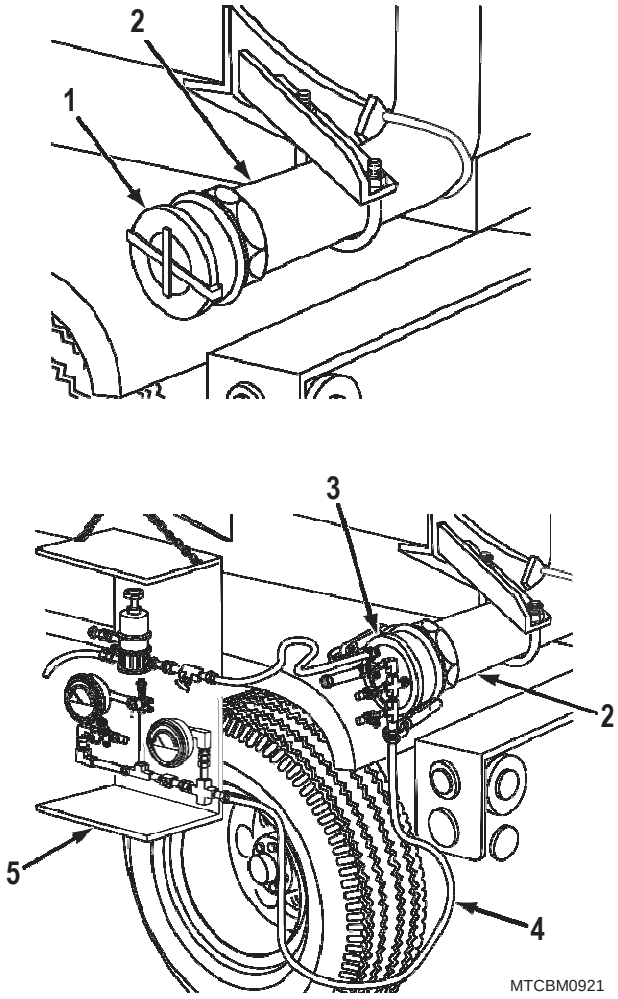


Figure 2. Vapor Vent Line and Coupling Assembly.

PRESSURE TEST PREPARATION - Continued

8. On regulator assembly (Figure 3, Item 14), close control shut-off valve (Figure 3, Item 1), valve (Figure 3, Item 7), draincock valve (Figure 3, Item 6), and valve (Figure 3, Item 13), and open valve (Figure 3, Item 8). On coupling assembly (Figure 3, Item 3), close valves (Figure 3, Items 2 and 4) and open valve (Figure 3, Item 5).
9. Turn valves (Figure 3, Items 9, 10, and 11) on regulator assembly (Figure 3, Item 14) to the horizontal position for positive pressure reading.

WARNING

Make sure regulator is set to its lowest setting (turned fully counterclockwise) to avoid overpressure in tank. The pneumatic test pressure in the tank must be reached gradually. If tank is overpressurized, close control shut-off valve and open draincock valve to reduce overpressure. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

10. Connect air pressure supply to regulator assembly port (Figure 3, Item 12).

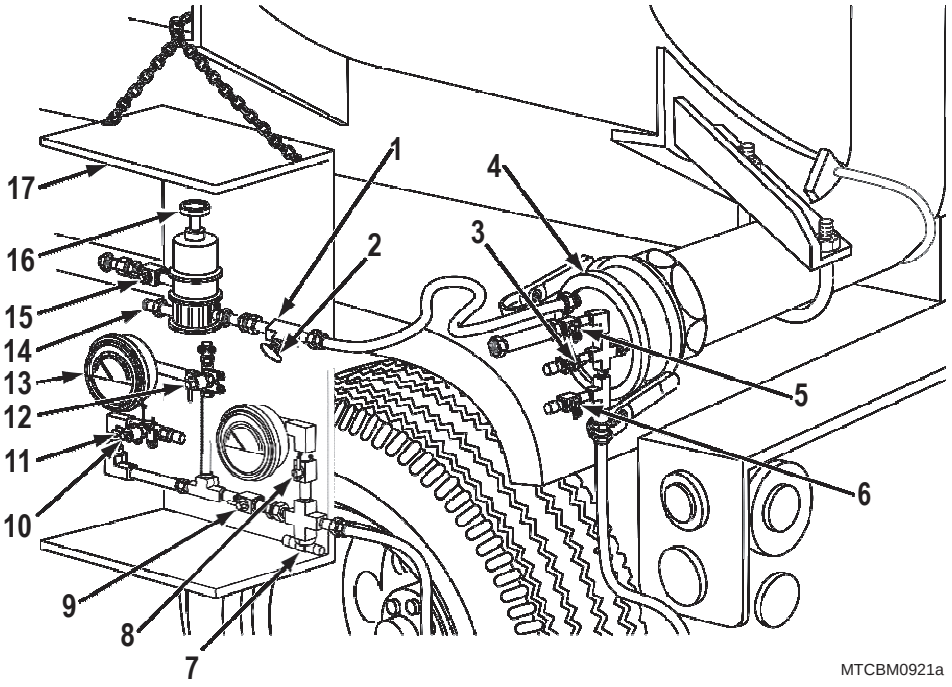


Figure 3. Coupling and Regulator Assembly.

END OF TASK

PRESSURE TEST PROCEDURE

1. Open emergency valve A (Figure 4, Item 2) and valves D and E (Figure 4, Items 3 and 4). Close valves G and J (Figure 4, Items 5 and 6).

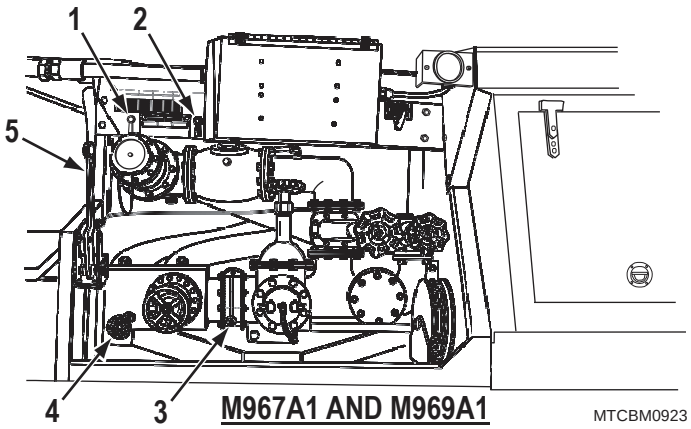


Figure 4. Control Valves and Regulator Assembly.

2. Open control shut-off valve (Figure 3, Item 7) on regulator assembly (Figure 3, Item 1).

WARNING

- Never remove any accessory items (e.g., manhole cover, cleanout caps) during pressure test. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Do not overpressure tank. If tank is overpressurized, close control shut-off valve and open draincock valve to reduce overpressure. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

3. Slowly adjust regulator assembly (Figure 3, Item 1) by turning regulator knob (Figure 3, Item 10) clockwise to increase flow of air into vapor return line and tank until a pressure reading of 18.0 in. (45.72 cm) Water Column (wc) is obtained on gage (Figure 3, Item 9).
4. Close control shut-off valve (Figure 3, Item 7) on regulator assembly (Figure 3, Item 1).
5. Wait 5 minutes to verify that pressure reading remains stable at 18.0 in. (45.72 cm) wc.
6. Close draincock valve (Figure 3, Item 8) after tank pressure has stabilized at 18.0 in. (45.72 cm) wc on gage (Figure 3, Item 9) and begin timing.

PRESSURE TEST PROCEDURE - Continued

7. At the end of an additional 5 minutes, record the time and final pressure from gage (Figure 3, Item 9). If pressure drops more than 0.5 in. (1.27 cm) wc, repressurize tank per Step 3 before connecting.
8. Check tank for leaks. Repair tank if leaking and restart test at Step 1.

CAUTION

- Although an emergency valve leak does not constitute a K stamp (indicating compliance with DOT 49CF180.407 (h)) failure if the leak is internal, proper emergency valve operator function is required for safe operation. Failure to comply may result in damage to, or destruction of, equipment or mission.
- Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

9. Close emergency valve A (Figure 5, Item 1) and monitor gage (Figure 5, Item 7) on regulator assembly (Figure 5, Item 8).
10. Wait 5 minutes to verify that pressure reading remains stable. If pressure drops more than 0.5 in. (1.27 cm) wc on gage (Figure 5, Item 7), go to Step 11. If pressure remains at 18.0 in. (45.72 cm) wc, go to Step 14.
11. Look for leaks in vapor vent line (Figure 5, Item 4); check vapor vent hood (Figure 5, Item 2), vapor vent hose (Figure 5, Item 10), and hose clamps (Figure 5, Item 9).
12. Return tank and piping system to normal atmospheric pressure by opening G valve (Figure 5, Item 11) and emergency valve A (Figure 5, Item 1).
13. Repair any leaks found in vapor vent line (Figure 5, Item 4), refer to (WP 0229). Restart test at Step 1.
14. Return vapor vent line (Figure 5, Item 4) to atmospheric pressure by opening draincock valve (Figure 5, Item 6) of regulator assembly (Figure 5, Item 8).
15. On regulator assembly (Figure 5, Item 8), close draincock valve (Figure 5, Item 6) and monitor gage (Figure 5, Item 7) for 5 minutes.
16. If no increase in pressure is indicated on gage (Figure 5, Item 7), vapor vent valve (Figure 5, Item 3) is functional. Go to Step 19. If there is an increase in pressure more than 0.5 in. (1.27 cm) wc, vapor vent valve (Figure 5, Item 3) is leaking. Go to Step 17.
17. Return vapor vent line (Figure 5, Item 4) to atmospheric pressure by opening draincock valve (Figure 5, Item 6) of regulator assembly (Figure 5, Item 8).
18. Repair any leaks found in vapor vent valve (Figure 5, Item 3). Restart test at Step 1.
19. Return tank and piping system to normal atmospheric pressure by opening G valve (Figure 5, Item 11) and emergency valve A (Figure 5, Item 1).
20. Remove coupling assembly (Figure 5, Item 5) from vapor vent line (Figure 5, Item 4). Install coupling assembly (Figure 5, Item 5) on discharge port of valve B (Figure 5, Item 12). Install a closed cap on the open vapor vent line (Figure 5, Item 4).
21. Open emergency valve A (Figure 5, Item 1). Pressurize tank and piping system according to Steps 3 thru 5 and then continue with Step 22.

PRESSURE TEST PROCEDURE - Continued

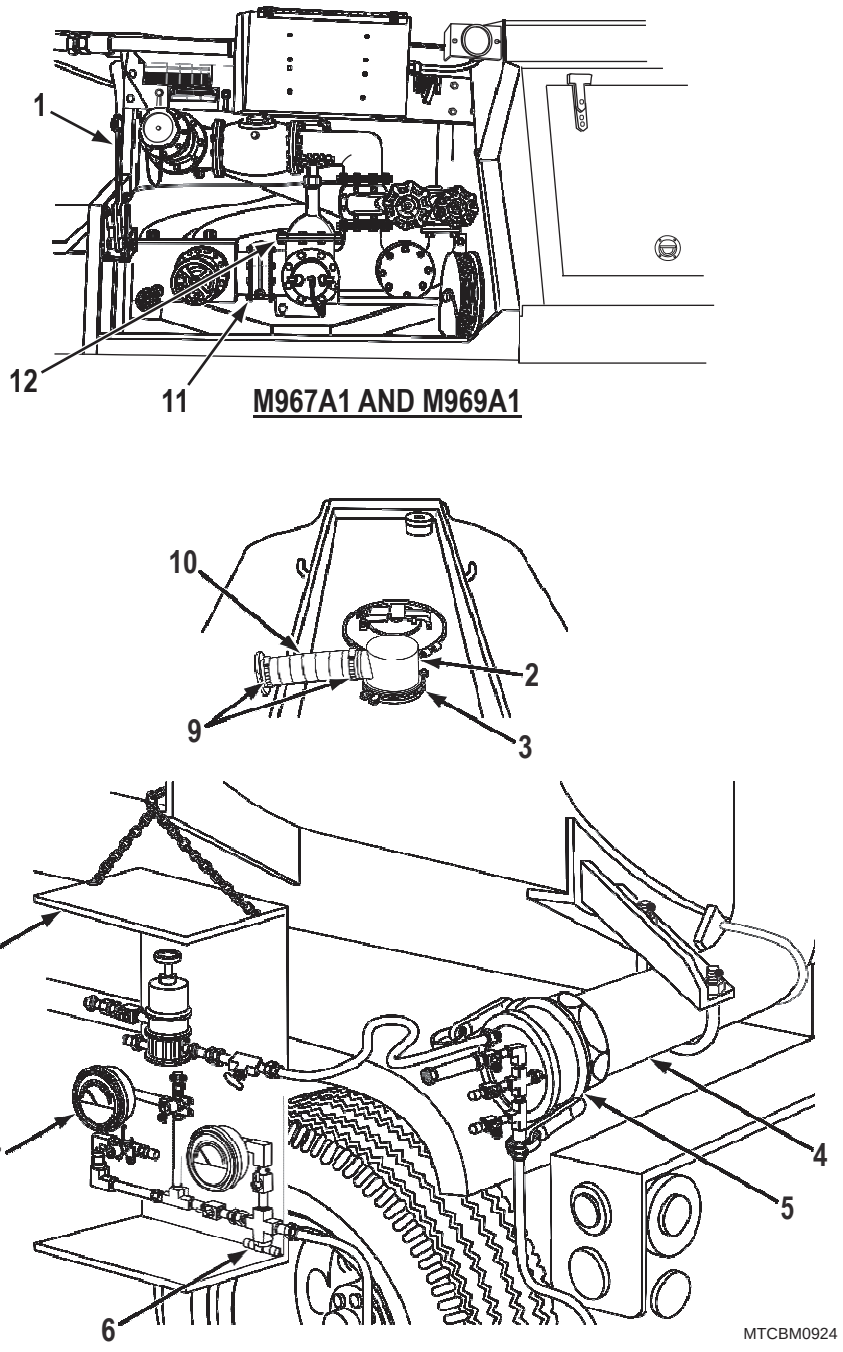


Figure 5. Vapor Vent Line and Control Valves.

PRESSURE TEST PROCEDURE - Continued

22. On regulator assembly (Figure 6, Item 1), monitor gage (Figure 6, Item 2) for 5 minutes to verify that pressure reading remains stable at 18.0 in. (45.72 cm) wc. If pressure does not drop more than 0.5 in. (1.27 cm) wc, go to Step 23.

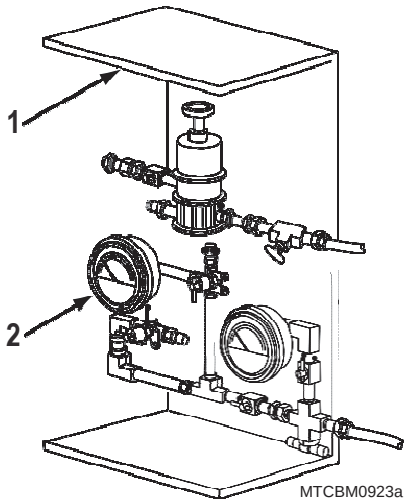


Figure 6. Regulator Assembly.

23. Repressurize tank and piping system according to Steps 3 thru 5. Close emergency valve A (Figure 7, Item 2). Monitor gage (Figure 6, Item 2) for 5 minutes. If pressure does not drop, go to Step 24. If pressure drops more than 0.5 in. (1.27 cm) wc piping system is leaking. Go to Step 27.
24. Check cleanout caps (Figure 7, Item 1), manhole cover (Figure 7, Item 6) and precheck circuit, and weld seams.
25. Return tank and piping system to atmospheric pressure by opening manifold drain valve (Figure 7, Item 5) and emergency valve A (Figure 7, Item 2).
26. Repair leak as required. Restart test from Step 1.
27. Locate leak in piping system, check G valve (Figure 7, Item 4), D valve (Figure 7, Item 3), precheck circuit, and hose clamps.
28. Return tank and piping system to atmospheric pressure by opening manifold drain valve (Figure 7, Item 5) and emergency valve A (Figure 7, Item 2).
29. Repair piping system leak as required. Restart test from Step 1.
30. Return tank and piping system to atmospheric pressure by closing emergency valve A (Figure 7, Item 2) and valve D (Figure 7, Item 3).
31. Open manifold drain valve (Figure 7, Item 5) and monitor gage (Figure 6, Item 2) on regulator assembly (Figure 6, Item 1) for 5 minutes.
32. If pressure on gage (Figure 6, Item 2) does not increase, go to Step 35. If pressure increases more than 0.5 in. (1.27 cm) wc and emergency valve is leaking, go to Step 33.

PRESSURE TEST PROCEDURE - Continued

CAUTION

Although an emergency valve leak does not constitute a K stamp (indicating compliance with DOT 49CF180.407 (h)) failure if the leak is internal, proper emergency valve operator function is required for safe trailer operation. Failure to comply may result in damage to, or destruction of, equipment or mission.

33. Return tank and piping system to atmospheric pressure by opening manifold drain valve (Figure 7, Item 5) and emergency valve A (Figure 7, Item 2).

NOTE

Do Steps 34 and 35 after test has been completed.

34. Repair emergency valve in accordance with (WP 0246). Restart test from Step 1.

35. Return tank and piping system to atmospheric pressure by opening manifold drain valve (Figure 7, Item 5) and emergency valve A (Figure 7, Item 2).

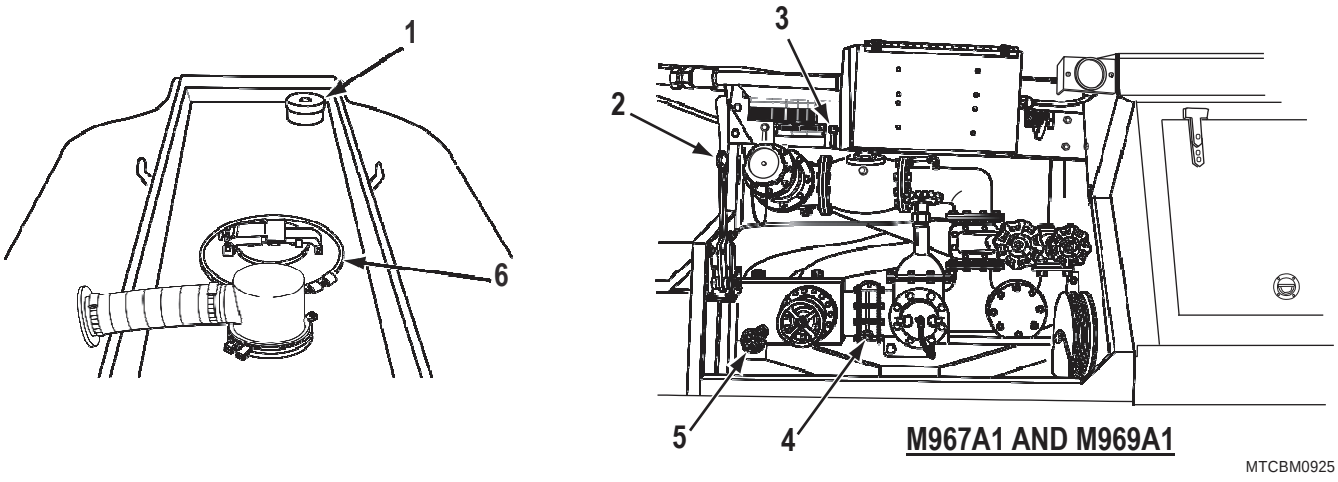


Figure 7. Piping System.

NOTE

After successful completion of various tests, DOT regulation 49CFR180.415 requires that a tanker be stamped with the appropriate letter (“K” stamp for leak test), as well as the test date (month and year).

36. Close all valves initially opened for pneumatic leak test, to allow fuel storage.

END OF TASK

VACUUM TEST PREPARATION

WARNING

- Use extreme caution when walking or working on the top of semitrailer. Walkway can become slippery due to moisture or fuel spillage. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Before performing the pressure or vacuum test, the semitrailer must be grounded to an approved (earth) ground and must be safe to proceed. Failure to follow this warning may cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Make sure tank and piping system are free of all liquid and that tank is purged of all vapor (implement the cleaning procedures, as applicable, refer to TB ORD 1031). Failure to follow this warning may cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Open manhole cover (Figure 8, Item 21), install test plate (Figure 8, Item 2), and fasten securely.
2. Ensure clamp ring (Figure 8, Item 3) for manhole cover (Figure 8, Item 21) is fastened securely.
3. Ensure both 3 in. (7.62 cm) cleanout caps (Figure 8, Item 1) are fastened securely.
4. Remove dust cap (Figure 8, Item 19) from vapor vent line (Figure 8, Item 20).
5. Attach coupling assembly (Figure 8, Item 7) to vapor vent line (Figure 8, Item 20).
6. Attach regulator assembly (Figure 8, Item 18) to hose assemblies (Figure 8, Item 6), and attach hose assemblies (Figure 8, Item 6) to coupling assemblies (Figure 8, Item 7).
7. On regulator assembly (Figure 8, Item 18), close control shut-off valve (Figure 8, Item 9) and draincock valve (Figure 8, Item 10), and open valves (Figure 8, Items 11 and 16).
8. On coupling assembly (Figure 8, Item 7), close valves (Figure 8, Items 4 and 8) and open valve (Figure 8, Item 5).
9. On regulator assembly (Figure 8, Item 18), turn valves (Figure 8, Items 12, 13, and 14) to vertical position for negative pressure reading.
10. Slowly adjust regulator assembly (Figure 8, Item 18) to its lowest setting by turning regulator knob (Figure 8, Item 17) fully clockwise.
11. Connect vacuum supply to regulator assembly port (Figure 8, Item 15).

VACUUM TEST PREPARATION - Continued

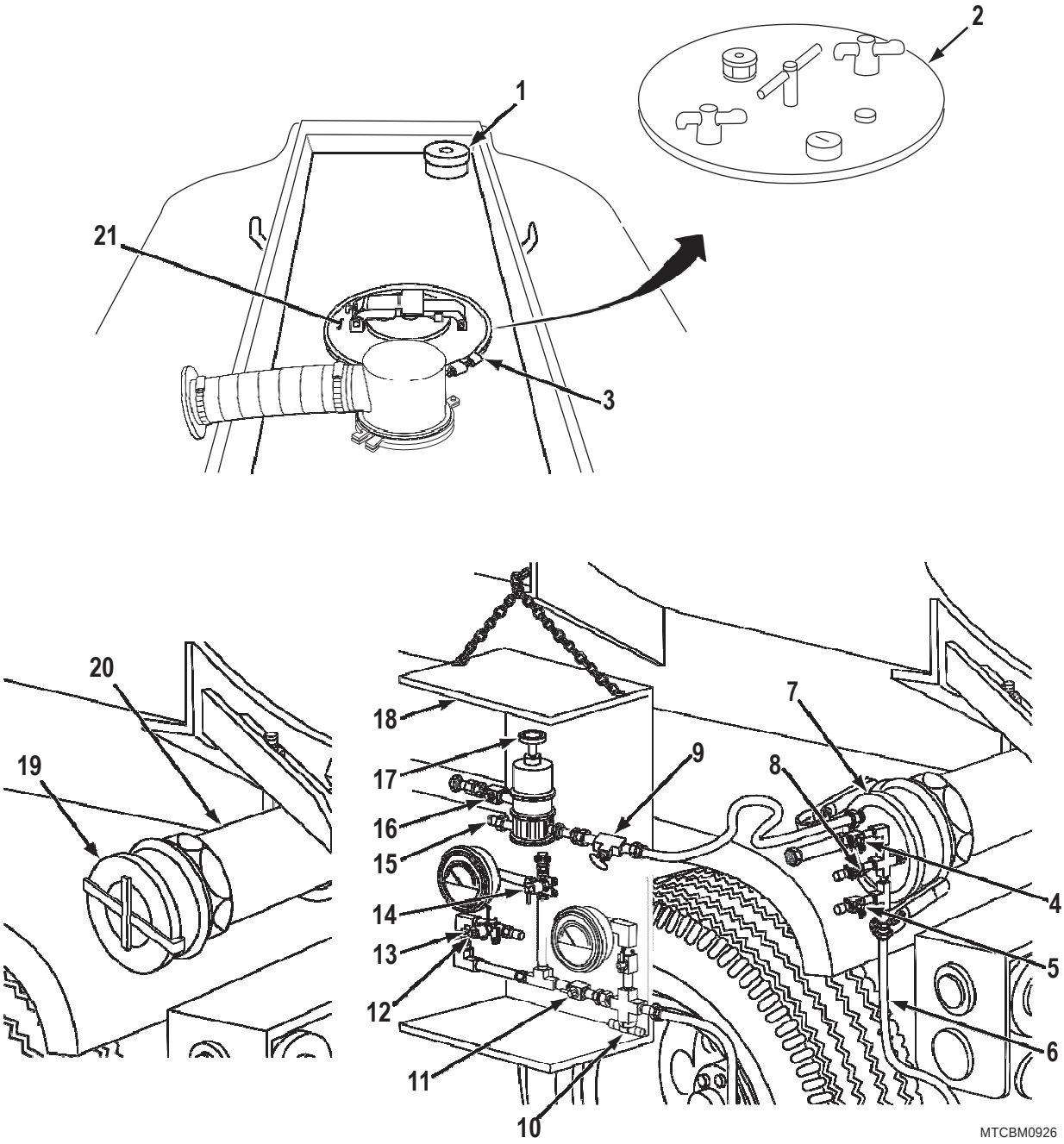


Figure 8. Vacuum Test Preparation.

END OF TASK

VACUUM TEST PROCEDURE

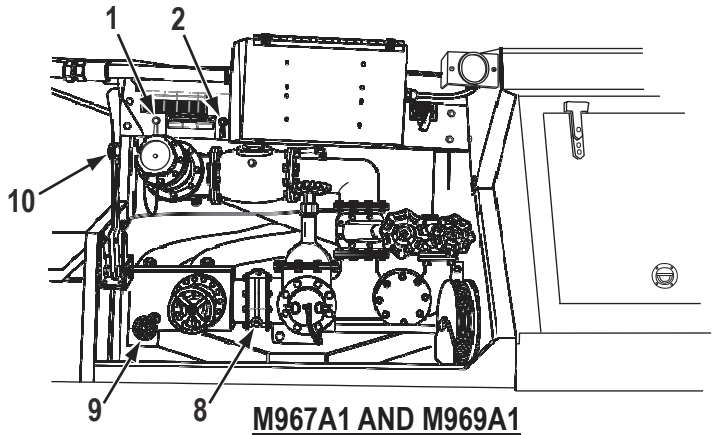
1. Open valves (Figure 9, Items 1 and 2) and emergency valve A (Figure 9, Item 10). Close G valve (Figure 9, Item 8) and manifold drain valve (Figure 9, Item 9).
2. Open control shut-off valve (Figure 9, Item 3) on regulator assembly (Figure 9, Item 6).

WARNING

- Never remove any accessory items (e.g., manhole cover, cleanout caps) during pressure test. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Do not overpressure tank. If tank is overpressurized, close control shut-off valve and open draincock valve to reduce overpressure. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

3. Slowly adjust regulator assembly (Figure 9, Item 6) by turning regulator knob (Figure 9, Item 7) counterclockwise to increase flow of air and evacuate tank and piping system, until a vacuum reading of 6.0 in. ± 0.5 in. (15.24-1.27 cm) wc is obtained on gage (Figure 9, Item 4).
4. Close control shut-off valve (Figure 9, Item 3) on regulator assembly (Figure 9, Item 6).
5. Wait 5 minutes to verify that pressure reading remains stable at 6.0 in. ± 0.5 in. (15.24-1.27 cm) wc on gage (Figure 9, Item 4).
6. If vacuum reading increases or decreases more than 0.5 in. (1.27 cm) wc on gage (Figure 9, Item 4), reevacuate tank per Steps 3 thru 5 and continue with Step 7. Initial test vacuum must be at 6.0 in. ± 0.5 in. (15.24-1.27 cm) wc.
7. If tank is overpressurized, close control shut-off valve (Figure 9, Item 3) and open draincock valve (Figure 9, Item 5) to reduce tank pressure. When tank pressure has dropped to 6.0 in. ± 0.5 in. (15.24-1.27 cm) wc, close draincock valve (Figure 9, Item 5).
8. Wait an additional 5 minutes, then record the time and final vacuum from gage (Figure 9, Item 4).
9. If vacuum does not drop on gage (Figure 9, Item 4), tank is leak free. If pressure drops more than 0.5 in. (1.27 cm) wc, reevacuate tank and piping system according to Steps 3 thru 5 then continue with Step 8.
10. Close emergency valve A (Figure 9, Item 10) and monitor gage (Figure 9, Item 4) on regulator assembly (Figure 9, Item 6).
11. Wait 5 minutes. If pressure does not drop more than 0.5 in. (1.27 cm) wc on gage (Figure 9, Item 4), go to Step 13. If pressure drops more than 0.5 in. (1.27 cm) wc, go to Step 12.

VACUUM TEST PROCEDURE - Continued



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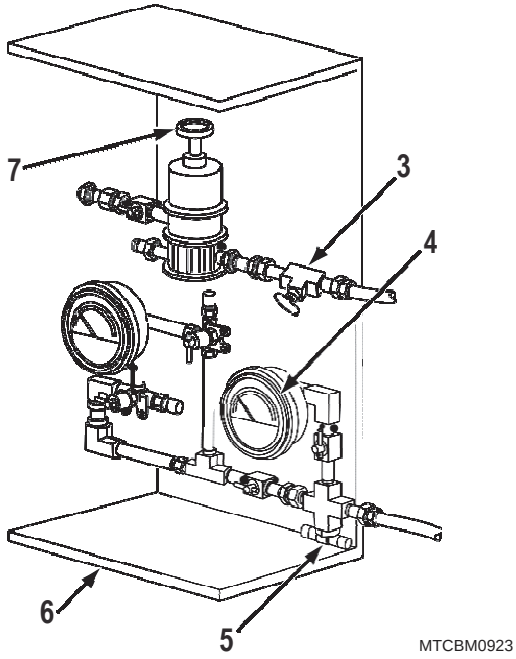


Figure 9. Emergency and Draincock Valve.

VACUUM TEST PROCEDURE - Continued

12. Locate the leak in vapor vent line (Figure 10, Item 2), check vapor vent hood (Figure 10, Item 7), vapor vent hose (Figure 10, Item 4), and hose clamps (Figure 10, Item 3).
13. Return tank and piping system to atmospheric pressure.
14. Repair any leaks found in vapor vent valve (Figure 10, Item 8). Restart test at Step 1.
15. Return vapor vent line (Figure 10, Item 2) to atmospheric pressure by opening draincock valve (Figure 10, Item 13) of regulator assembly (Figure 10, Item 15).
16. On regulator assembly (Figure 10, Item 15), close draincock valve (Figure 10, Item 13) and monitor gage (Figure 10, Item 14) for 5 minutes.
17. If pressure on gage (Figure 10, Item 14) does not increase, vapor vent is functional; go to Step 20. If vacuum increases more than 0.5 in. (1.27 cm) wc, vapor vent valve is leaking. Go to Step 18.
18. Return tank and piping system to atmospheric pressure by opening G valve (Figure 10, Item 9) and emergency valve A (Figure 10, Item 12).
19. Repair any leaks found in vapor vent valve (Figure 10, Item 8) as required. Restart test from Step 1.
20. Return tank and piping system to atmospheric pressure by opening G valve (Figure 10, Item 9) and emergency valve A (Figure 10, Item 12).
21. Remove coupling assembly (Figure 10, Item 1) from vapor vent line (Figure 10, Item 2).
22. Install coupling assembly (Figure 10, Item 1) on discharge port of valve B (Figure 10, Item 10).
23. Install a closed cap on the now open vapor vent line (Figure 10, Item 2).
24. Open emergency valve A (Figure 10, Item 12). Evacuate tank and piping system according to Steps 3 and 5, then continue with Step 25.
25. Wait 5 minutes to verify that vacuum reading on gage (Figure 10, Item 14) remains stable. If vacuum does not drop, go to Step 34. If vacuum drops more than 0.5 in. (1.27 cm) wc, go to Step 26.
26. Reevacuate tank and piping system according to Steps 3 thru 5; then continue with Step 27.
27. Close emergency valve A (Figure 10, Item 12). Wait 5 minutes to verify that vacuum reading on gage (Figure 10, Item 14) remains stable. If vacuum does not drop, tank is leaking; go to Step 28. If vacuum drops more than 0.5 in. (1.27 cm) wc, piping system is leaking. Go to Step 31.
28. Locate leak in tank, check cleanout caps (Figure 10, Item 6), manhole cover (Figure 10, Item 5), precheck circuit and weld seams.

VACUUM TEST PROCEDURE - Continued

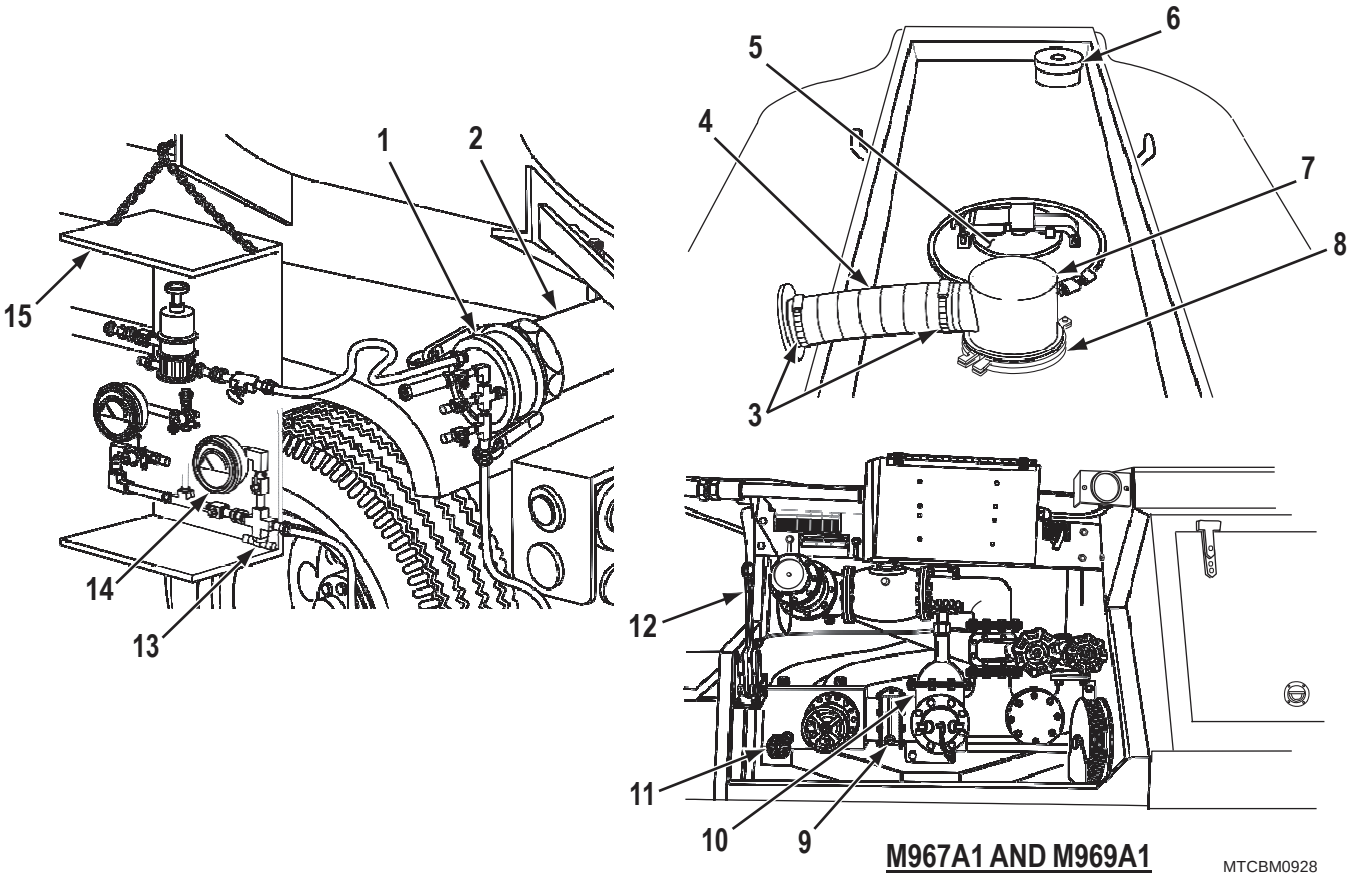


Figure 10. Vapor Vent Valve.

29. Return tank and piping system to atmospheric pressure by opening manifold drain valve (Figure 10, Item 11) and emergency valve A (Figure 10, Item 12).
30. Repair tank leak as required. Restart test at Step 1.
31. Locate leak in piping system, check G valve (Figure 10, Item 9), precheck circuit, and hose clamps.
32. Return tank and piping system to atmospheric pressure by opening manifold valve (Figure 10, Item 11) and emergency valve A (Figure 10, Item 12).
33. Repair piping system leaks. Restart test at Step 1.
34. Return tank and piping system to atmospheric pressure by opening emergency valve A (Figure 10, Item 12).
35. Open manifold drain valve (Figure 10, Item 11) to relieve vacuum.
36. Close manifold drain valve (Figure 10, Item 11) and monitor gage (Figure 10, Item 14) on regulator assembly (Figure 10, Item 15).
37. Wait 5 minutes to verify that vacuum reading on gage (Figure 10, Item 14) remains stable. If vacuum does not increase, go to Step 40. If vacuum reading increases more than 0.5 in. (1.27 cm) wc, emergency valve is leaking, go to Step 38.

VACUUM TEST PROCEDURE - Continued

CAUTION

Although an emergency valve leak does not constitute a K stamp (indicating compliance with DOT 49CF180.407 (h)) failure if the leak is internal, proper emergency valve operator function is required for safe tanker operation. Failure to comply may result in damage to, or destruction of, equipment or mission.

38. Return tank and piping system to atmospheric pressure by opening manifold drain valve (Figure 11, Item 1) and emergency valve A (Figure 11, Item 2).

39. Repair emergency valve in accordance with (WP 0246). Restart test at Step 1.

NOTE

Do Steps 40 and 41 after test has been completed.

40. Return tank and piping system to atmospheric pressure by opening manifold drain valve (Figure 11, Item 1) and emergency valve A (Figure 11, Item 2).

NOTE

After successful completion of various tests, DOT regulation 49CFR180.415 requires that a tanker be stamped with the appropriate letter (“K” stamp for leak test), as well as the test date (month and year).

41. Close all valves.

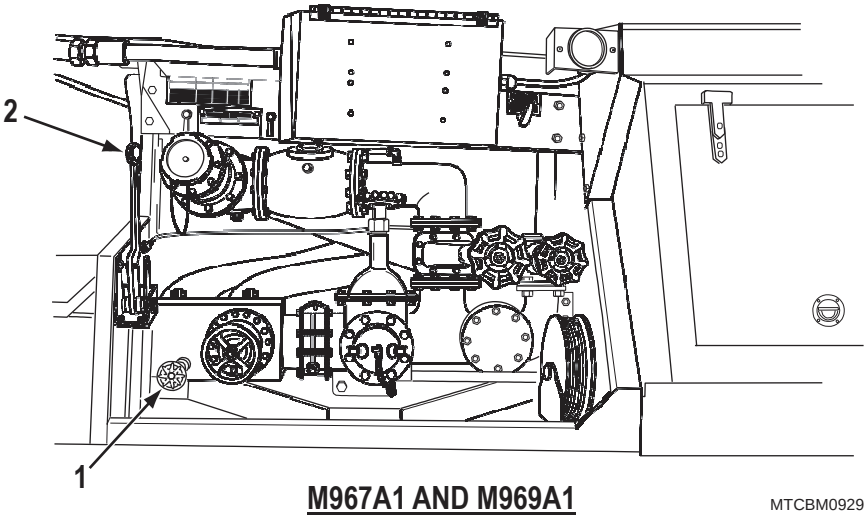


Figure 11. Manifold Drain Valve and Piping System.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HOSE REEL CABINET ELECTRICAL LEADS AND CABLE ASSEMBLY REPAIR

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
TM 9-2330-339-23P
WP 0102

Equipment Condition
Negative battery cables disconnected (WP 0098)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

REMOVAL

WARNING

When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Use illustrations in TM 9-2330-339-23P to locate, remove, and install cabinet electrical leads and cable assemblies wiring.

END OF TASK

REPAIR

NOTE

Repair of cabinet electrical leads and cable assemblies can be performed without removing them from conduit.

1. Check ends of cabinet electrical leads and cable assemblies for frayed insulation and broken wires. Refer to (WP 0102).
2. Inspect wires for bent, broken, or missing terminals (WP 0102).

END OF TASK

FOLLOW ON TASK

Connect negative battery cables (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HOSE REEL CONDUIT ASSEMBLY REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Cable assembly removed from hose reel conduit
(WP 0233)

Equipment Condition (cont.)
Negative battery cables disconnected (WP 0098)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

REMOVAL

WARNING

When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Loosen conduit connector (Figure 1, Item 5) on bushing (Figure 1, Item 6) on hose reel rewind switch (Figure 1, Item 7).
2. Remove conduit (Figure 1, Item 1) from conduit elbow (Figure 1, Item 2).
3. Remove conduit connector (Figure 1, Item 4) and bushing (Figure 1, Item 6) from hose reel rewind switch (Figure 1, Item 7).
4. Remove conduit connector (Figure 1, Item 4) from junction box (Figure 1, Item 3).

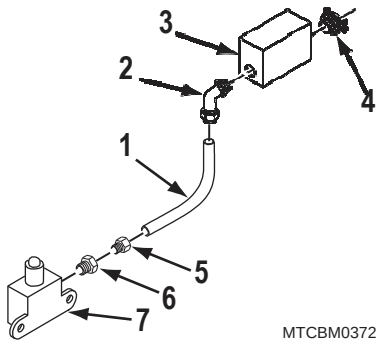


Figure 1. Hose Reel Conduit Assembly Replacement.

REMOVAL - Continued

5. Remove conduit (Figure 2, Item 4) from conduit elbow (Figure 2, Item 5).
6. Remove conduit elbow (Figure 2, Item 1) from junction box (Figure 2, Item 2) and semitrailer.
7. Remove conduit (Figure 2, Item 6) from two conduit elbows (Figure 2, Items 5 and 7).
8. Remove conduit elbow (Figure 2, Item 7) from junction box (Figure 2, Item 8).
9. Loosen conduit elbows (Figure 2, Items 10 and 12) and remove conduit (Figure 2, Item 11).
10. Remove conduit elbows (Figure 2, Items 10 and 12) from junction box (Figure 2, Item 8) and hose reel switch (Figure 2, Item 9).

END OF TASK

INSTALLATION

1. Install conduit elbows (Figure 2, Items 10 and 12) on junction box (Figure 2, Item 8) and hose reel switch (Figure 2, Item 9).
2. Install conduit (Figure 2, Item 11) and tighten conduit elbows (Figure 2, Items 10 and 12).
3. Install conduit elbow (Figure 2, Item 7) on junction box (Figure 2, Item 8).
4. Install conduit (Figure 2, Item 6) and conduit elbow (Figure 2, Item 5). Tighten conduit elbow (Figure 2, Item 7).
5. Install conduit elbow (Figure 2, Item 1) on semitrailer and junction box (Figure 2, Item 2).
6. Install conduit (Figure 2, Item 4) on conduit elbow (Figure 2, Item 5).
7. Install conduit connector (Figure 2, Item 3) in junction box (Figure 2, Item 2).
8. Install bushing (Figure 2, Item 15) and conduit connector (Figure 2, Item 14) on hose reel rewind switch (Figure 2, Item 16).
9. Install conduit (Figure 2, Item 13) on conduit elbow (Figure 2, Item 1) and conduit connector (Figure 2, Item 14).
10. Tighten conduit connector (Figure 2, Item 14) on bushing (Figure 2, Item 15) on hose reel rewind switch (Figure 2, Item 16).

INSTALLATION - Continued

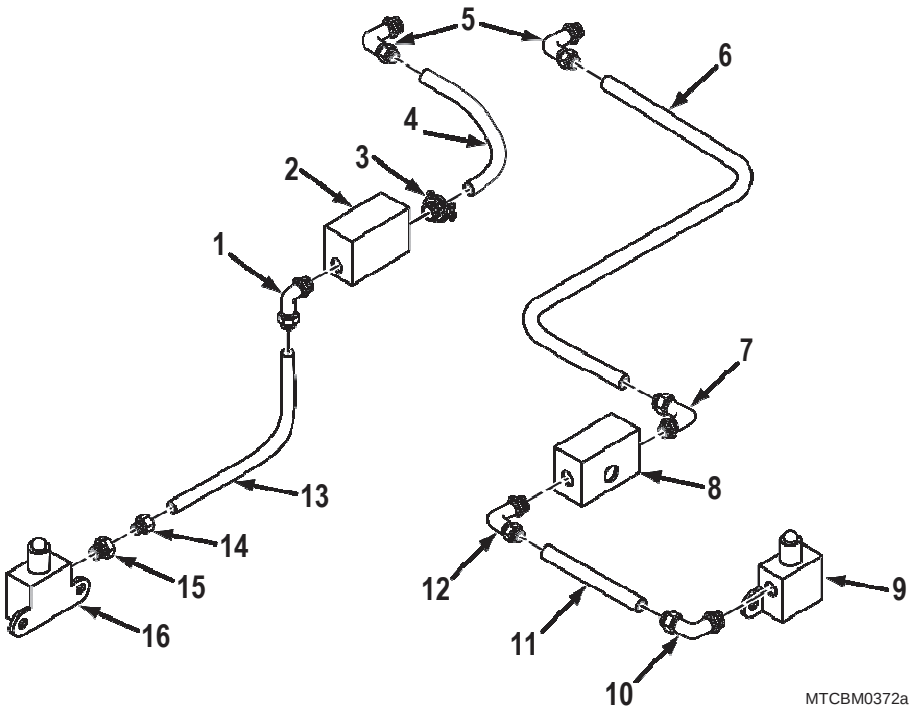


Figure 2. Hose Reel Conduit Assembly Replacement.

END OF TASK

FOLLOW ON TASK

1. Install cable assembly in hose reel conduit (WP 0233).
2. Connect negative battery cables (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HOSE REEL CONDUIT ASSEMBLY REPLACEMENT (M969A1 AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Negative battery cables disconnected (WP 0098)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

REMOVAL

1. Loosen two conduit connectors (Figure 1, Item 3) on two bushings (Figure 1, Item 4) and on two hose reel rewind switches (Figure 1, Item 5).
2. Remove two conduits (Figure 1, Item 2) from two conduit elbows (Figure 1, Item 1).

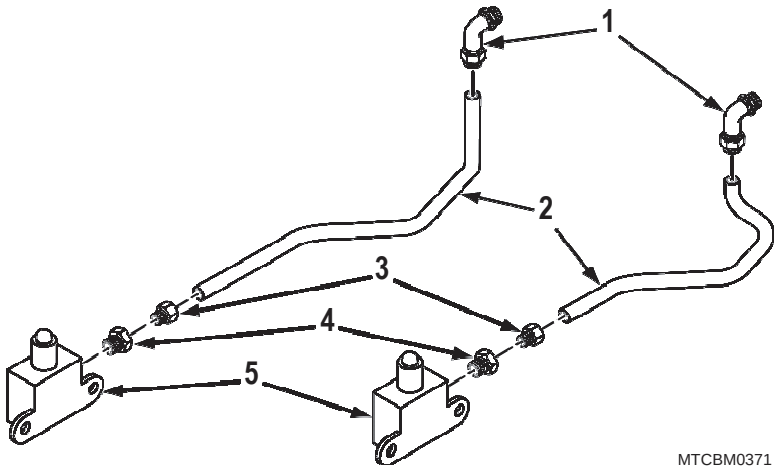


Figure 1. Hose Reel Conduit Assembly Removal.

REMOVAL - Continued

3. Remove two conduit elbows (Figure 2, Item 1) from two junction boxes (Figure 2, Items 4 and 5).
4. Remove two conduits (Figure 2, Item 3) from four conduit elbows (Figure 2, Item 1).
5. Remove conduit (Figure 2, Item 3) from two conduit bushings (Figure 2, Item 2).
6. Remove four conduit elbows (Figure 2, Item 1) from two junction boxes (Figure 2, Items 4 and 5) and semitrailer.

END OF TASK

INSTALLATION

1. Install four conduit elbows (Figure 2, Item 1) on semitrailer and two junction boxes (Figure 2, Items 4 and 5).
2. Install conduit (Figure 2, Item 3) on two conduit bushings (Figure 2, Item 2).
3. Install two conduits (Figure 2, Item 3) on four conduit elbows (Figure 2, Item 1).
4. Install two conduit elbows (Figure 2, Item 1) in two junction boxes (Figure 2, Items 4 and 5).
5. Install two bushings (Figure 2, Item 7) and conduit connectors (Figure 2, Item 6) on two hose reel rewind switches (Figure 2, Item 8).
6. Install two conduits (Figure 2, Item 3) on two conduit elbows (Figure 2, Item 1) and conduit connectors (Figure 2, Item 6).
7. Tighten two conduit connectors (Figure 2, Item 6) on two bushings (Figure 2, Item 7).

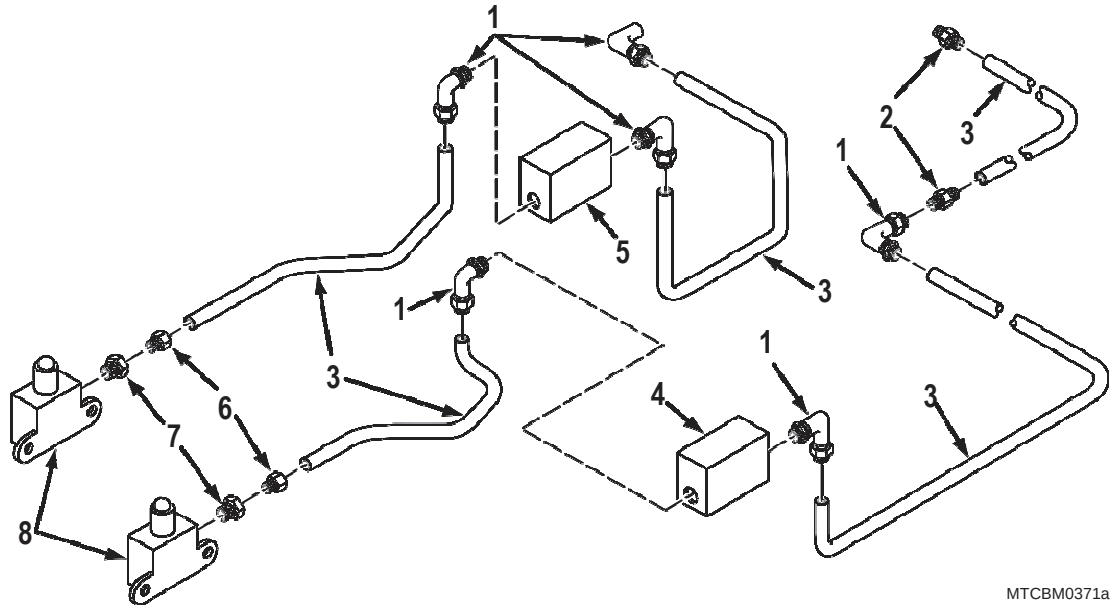


Figure 2. Hose Reel Conduit Assembly Replacement.

END OF TASK

FOLLOW ON TASK

Connect negative battery cables (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
IN-TANK LIQUID LEVEL GAGE ASSEMBLY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Equipment Condition
Open manhole cover (WP 0166)

Materials/Parts
Pin, Cotter (WP 0295, Table 1, Item 180)

REMOVAL

Remove cotter pin (Figure 1, Item 2), nut (Figure 1, Item 3), and indicator (Figure 1, Item 4) from rod (Figure 1, Item 1). Discard cotter pin (Figure 1, Item 2).

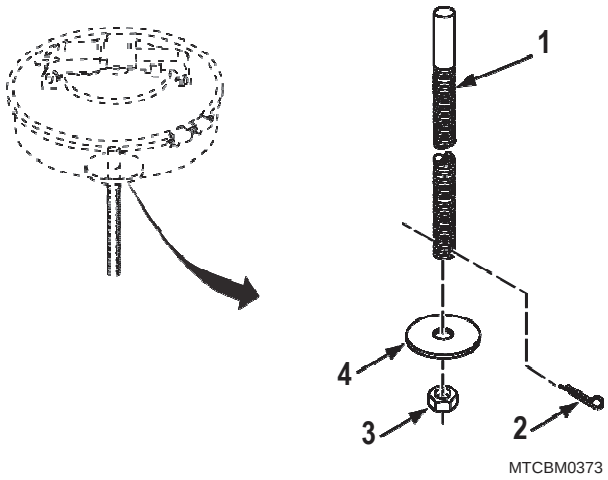


Figure 1. In-Tank Liquid Level Gage Disassembly.

END OF TASK

INSTALLATION

Install indicator (Figure 2, Item 4), nut (Figure 2, Item 3), and new cotter pin (Figure 2, Item 2) on rod (Figure 2, Item 1).

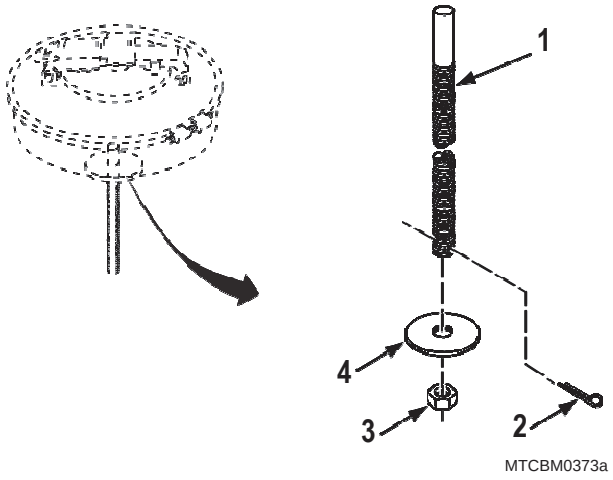


Figure 2. In-Tank Liquid Level Gage Assembly.

END OF TASK

FOLLOW ON TASK

Close manhole cover (WP 0166).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
PRESSURE RELIEF REGULATING VALVE REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

Materials/Parts
Cap and Plug Set (WP 0293, Table 1, Item 3)

WARNING

- Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Read and observe all safety precautions listed in the warning summary before performing maintenance on filter/separator. Ensure that semitrailer is grounded to an approved ground (earth) and it is safe to proceed. Failure to follow this warning may cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove pressure relief regulating valve (Figure 1, Item 1) from top of filter separator (Figure 1, Item 2).
2. Plug opening in top of filter separator (Figure 1, Item 2) to prevent contamination of fuel.

END OF TASK

INSTALLATION

1. Remove plug from opening in top of filter separator (Figure 1, Item 2).
2. Install pressure relief regulating valve (Figure 1, Item 1) in top of filter separator (Figure 1, Item 2).

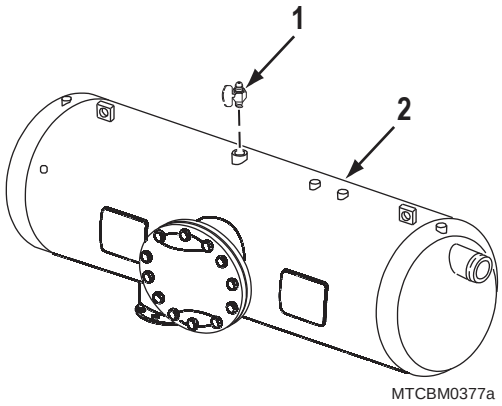


Figure 1. Pressure Relief Regulating Valve.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FILTER/SEPARATOR REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Compound, Thread Sealing
(WP 0293, Table 1)
Coupling, Clamp, Pipe
Qty: (2) (WP 0295, Table 1, Item 154)
Strap, Tiedown (WP 0293, Table 1, Item 27)
Strap, Webbing (WP 0293, Table 1, Item 27)

Personnel Required
Two

Equipment Condition
Semitrailer uncoupled (WP 0007)
Semitrailer bonded and grounded (WP 0008)
Negative battery cables disconnected (WP 0098)
Semitrailer fuel tank drained (WP 0201)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Close valve (Figure 1, Item 10) at side of filter/separator (Figure 1, Item 2).
2. Open valve (Figure 1, Item 11) to drain any residual fuel.
3. Remove four nuts (Figure 1, Item 7), bolts (Figure 1, Item 8), two pipe clamp couplings (Figure 1, Item 9) from filter/separator (Figure 1, Item 2). Discard pipe clamp couplings (Figure 1, Items 9).
4. Remove three fittings (Figure 1, Item 1) from filter/separator (Figure 1, Item 2).
5. Remove tiedown straps (Figure 1, Item 13) from brackets (Figure 1, Item 12) at top of filter/separator (Figure 1, Item 2).
6. Remove plug (Figure 1, Item 3).

WARNING

Position suitable support under filter/separator to support weight. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

7. Remove four nuts (Figure 1, Item 4), washers (Figure 1, Item 5), two mounting brackets (Figure 1, Item 6), strap webbing, and filter/separator (Figure 1, Item 2) from semitrailer. Discard strap webbing.

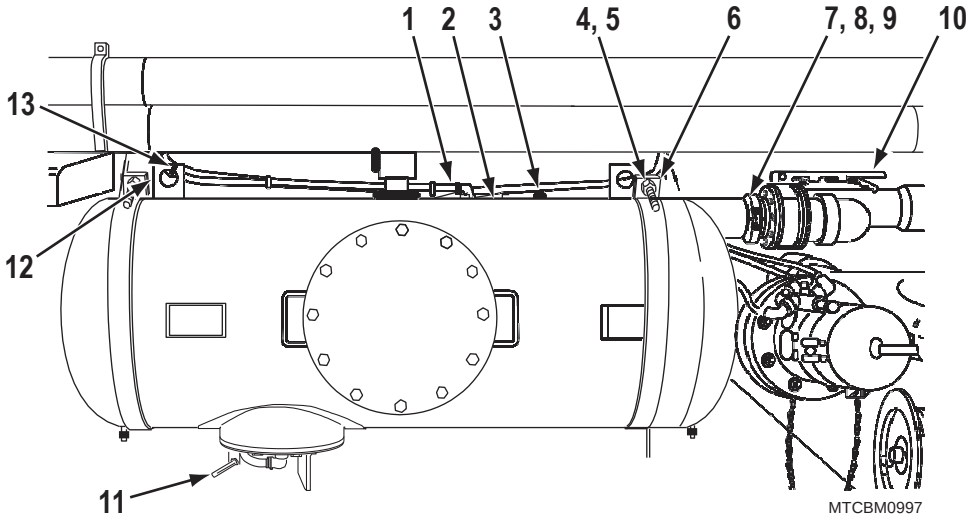


Figure 1. Filter/Separator Removal.

END OF TASK

INSTALLATION

1. Install filter/separator (Figure 1, Item 2), two new strap webbings, mounting brackets (Figure 1, Item 6), four washers (Figure 1, Item 5), and four nuts (Figure 1, Item 4) to semitrailer.
2. Install three fittings (Figure 2, Item 2) on filter/separator (Figure 2, Item 1).
3. Install two new pipe clamp couplings (Figure 2, Item 3), four bolts (Figure 2, Item 4), and nuts (Figure 2, Item 5) to filter/separator (Figure 2, Item 1).
4. Install tiedown straps (Figure 1, Item 13) to brackets (Figure 1, Item 12) at top of filter/separator (Figure 1, Item 2).

NOTE

Apply thread sealing compound to threads of plug prior to installation.

5. Close valve (Figure 1, Item 11) and install plug (Figure 2, Item 6).

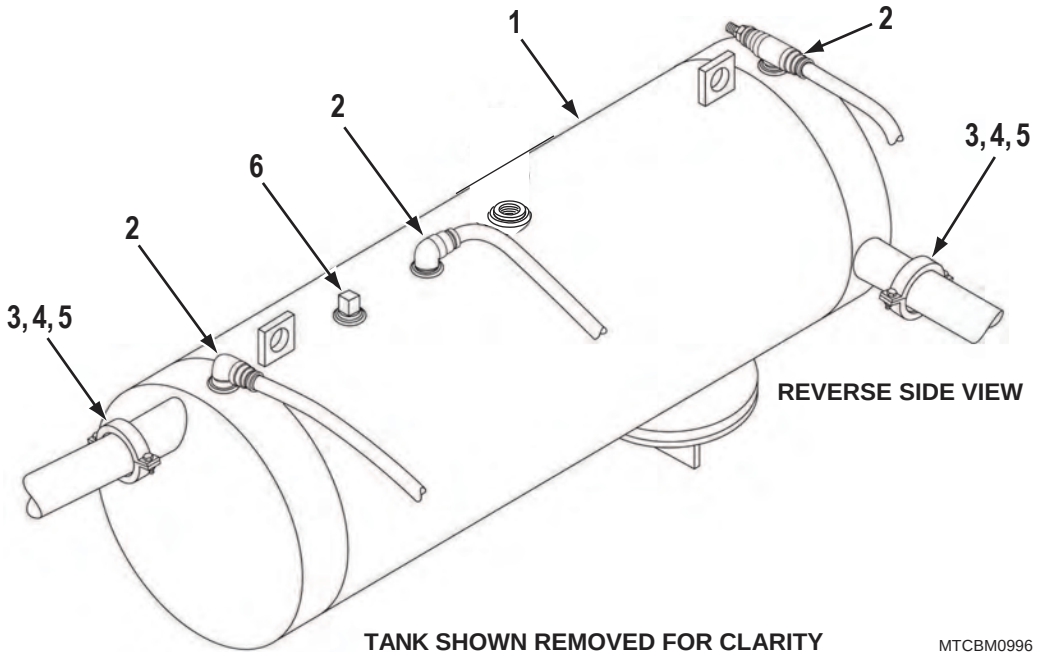


Figure 2. Filter/Separator, Rear View.

END OF TASK

Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AUTOMATIC DRAIN VALVE AND FLOAT REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

Materials/Parts
O-Ring (WP 0295, Table 1, Item 187)

WARNING

- Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Read and observe all safety precautions listed in the warning summary before performing maintenance on filter/separator. Ensure that semitrailer is grounded to an approved ground (earth) and it is safe to proceed. Failure to follow this warning may cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Open manual drain valve N (Figure 1, Item 4) to remove any fluid from filter separator (Figure 1, Item 1). Close manual drain valve N (Figure 1, Item 4) when thoroughly drained.

NOTE

- DO NOT disconnect tubes connecting float assembly to automatic drain.
- M970A1 has two tubes to disconnect/connect.

2. Disconnect tube from top of filter/separator (Figure 1, Item 1) at the float assembly (Figure 1, Item 5).
3. Remove eight capscrews (Figure 1, Item 3), washers (Figure 1, Item 2), and automatic drain valve (Figure 1, Item 7), and float assembly (Figure 1, Item 5).
4. Remove and discard O-ring (Figure 1, Item 6).

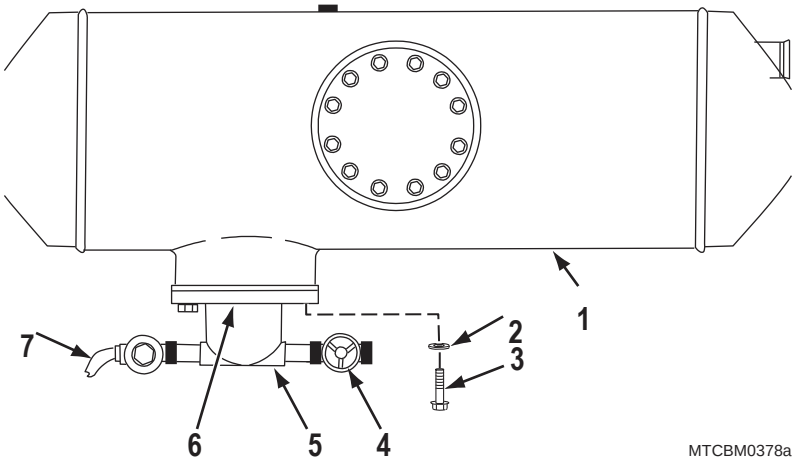


Figure 1. Drain Valve N Replacement.

END OF TASK

INSTALLATION

1. Position automatic drain valve (Figure 1, Item 7), float assembly (Figure 1, Item 5), and new O-ring (Figure 1, Item 6) on filter/separator (Figure 1, Item 1). Secure with eight capscrews (Figure 1, Item 3) and washers (Figure 1, Item 2).
2. Connect tube to top of filter/separator (Figure 1, Item 1).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FILTER/SEPARATOR FILTER ELEMENTS MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Cap and Plug Set (WP 0293, Table 1, Item 3)
Gasket Qty: (5) (WP 0295, Table 1, Item 5)
Gasket Qty: (5) (WP 0295, Table 1, Item 7)
Gasket (WP 0295, Table 1, Item 42)
Gasket, Base
Qty: (5) (WP 0295, Table 1, Item 6)
Petrolatum (WP 0293, Table 1, Item 19)
Seal, Antipilferage

Materials/Parts (cont.)
Qty: (2) (WP 0295, Table 1, Item 144)
Washer, Lock
Qty: (12) (WP 0295, Table 1, Item 50)
Washer, Lock
Qty: (7) (WP 0295, Table 1, Item 51)

Equipment Condition
Close all fuel dispensing valves (WP 0004)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

- Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Read and observe all safety precautions listed in the warning summary before performing maintenance on filter/separator. Ensure that semitrailer is grounded to an approved ground (earth) and it is safe to proceed. Failure to follow this warning may cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

- The semitrailer is equipped with five filter assemblies in the rear of the filter separator and 15 filter elements in the front. Removal of all five filter assemblies is the same. Removal of all 15 filter elements is the same. One of each is shown.
- Make sure all valves are closed.

REMOVAL

1. Open manual drain valve N (Figure 1, Item 2) to remove any fluid from filter separator (Figure 1, Item 1). Close manual drain valve N (Figure 1, Item 2) when thoroughly drained.

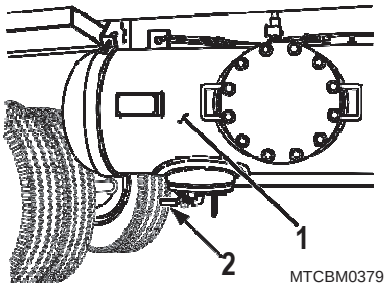


Figure 1. Fluid Draining.

NOTE

Note location of antipilferage seals for ease of installation.

2. Cut two antipilferage seals from screws at top and bottom of access cover. Discard seals.
3. Remove 12 nuts (Figure 2, Item 4), screws (Figure 2, Item 7), 24 washers (Figure 2, Item 2), and 12 lockwashers (Figure 2, Item 3) from access cover (Figure 2, Item 6) and mounting flange of filter separator (Figure 2, Item 1). Discard lockwashers (Figure 2, Item 3).
4. Remove access cover (Figure 2, Item 6) and gasket (Figure 2, Item 5) from filter separator (Figure 2, Item 1). Discard gasket (Figure 2, Item 5).

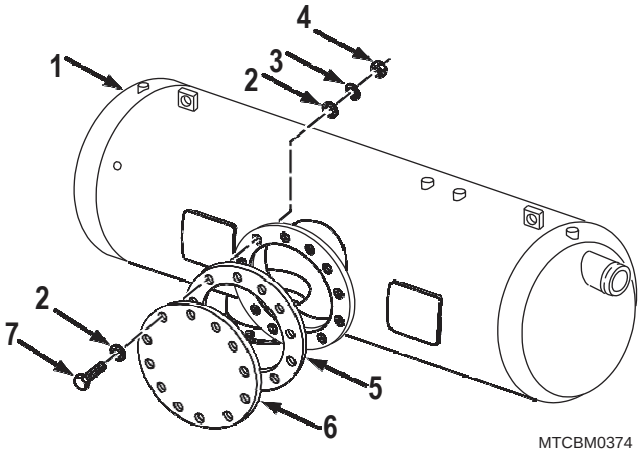


Figure 2. Access Cover Removal.

REMOVAL - Continued

5. Remove seven nuts (Figure 3, Item 5), lockwashers (Figure 3, Item 6), washers (Figure 3, Item 7), and retaining plate (Figure 3, Item 4) from five filter assemblies (Figure 3, Item 9). Discard lockwashers (Figure 3, Item 6).
6. Starting with lower filter assembly (Figure 3, Item 9) nearest to service opening (Figure 3, Item 10), remove spring tension clip (Figure 3, Item 8) and pull filter assembly (Figure 3, Item 9) to the right until it drops down and can be removed from filter separator (Figure 3, Item 1) through service opening (Figure 3, Item 10).
7. Repeat Step 6 to remove remaining four filter assemblies (Figure 3, Item 9).
8. Remove retainer nut (Figure 3, Item 3) from filter element (Figure 3, Item 2) and slide filter element (Figure 3, Item 2) off guide pipe and out of filter separator (Figure 3, Item 1).
9. Repeat Step 8 to remove remaining four filter elements (Figure 3, Item 2).

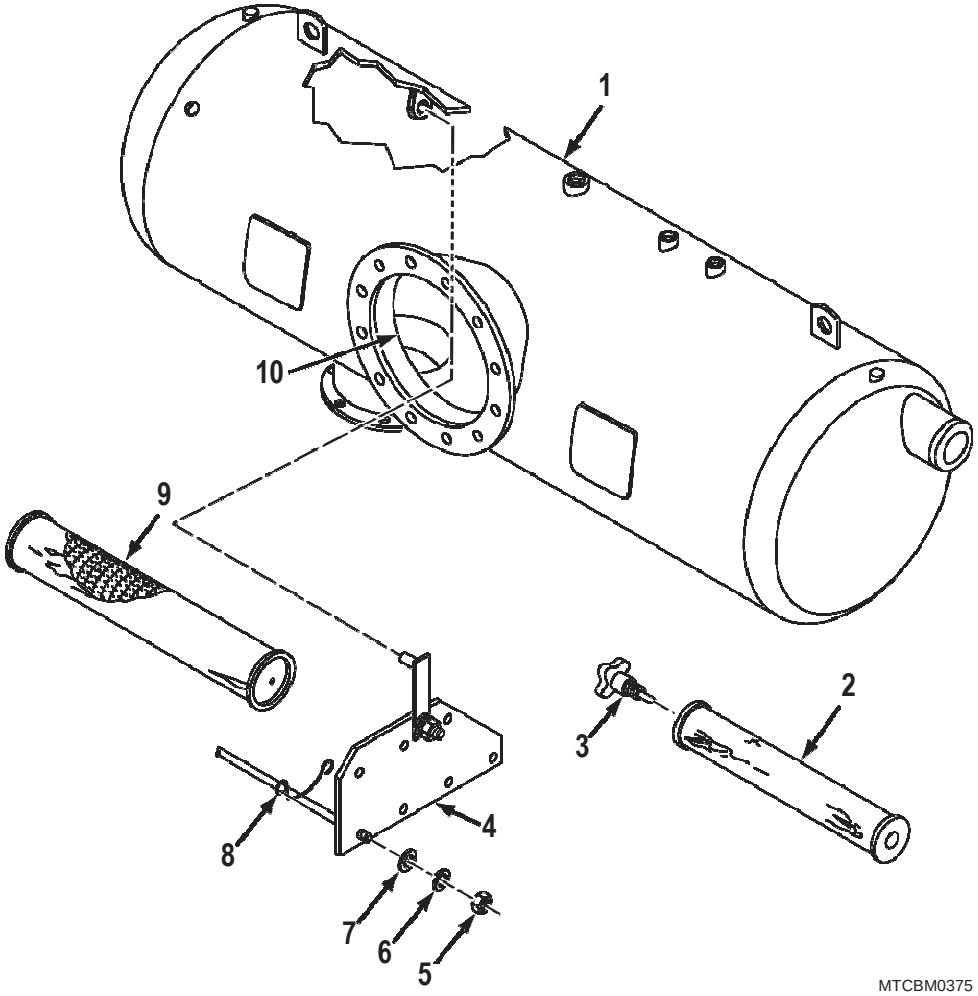


Figure 3. Filter/Separator Filter Elements Removal.

END OF TASK

DISASSEMBLY

1. Remove filter adapter assembly (Figure 4, Item 14), three filter elements (Figure 4, Item 10) and fuse monitor bracket (Figure 4, Item 9) from filter assembly (Figure 4, Item 2).
2. Remove three gaskets (Figure 4, Items 11, 13, and 15) and monitor mounting plate (Figure 4, Item 12) from filter adapter assembly (Figure 4, Item 14). Discard gaskets (Figure 4, Items 11, 13, and 15).
3. Remove seven stay rods (Figure 4, Item 17) and spring tension clip (Figure 4, Item 16) from filter separator (Figure 4, Item 1), if necessary.
4. Remove nut (Figure 4, Item 7), lockwasher (Figure 4, Item 6), two washers (Figure 4, Item 4), screw (Figure 4, Item 3), and guide bar (Figure 4, Item 5) from retaining plate (Figure 4, Item 8), if necessary. Discard lockwasher (Figure 4, Item 6).

END OF TASK

ASSEMBLY

1. Install three new gaskets (Figure 4, Items 11, 13, and 15) and monitor mounting plate (Figure 4, Item 12) in filter adapter assembly (Figure 4, Item 14).
2. Install three filter elements (Figure 4, Item 10) in filter adapter assembly (Figure 4, Item 14).
3. Install fuse monitor bracket (Figure 4, Item 9) on top of three filter elements (Figure 4, Item 10).
4. Install filter assembly (Figure 4, Item 2) over three filter elements (Figure 4, Item 10) and push into filter adapter assembly (Figure 4, Item 14).
5. If removed, install seven stay rods (Figure 4, Item 17) and spring tension clips (Figure 4, Item 16) in filter separator (Figure 4, Item 1).
6. If removed, install guide bar (Figure 4, Item 5) on retaining plate (Figure 4, Item 8) with screw (Figure 4, Item 3), two washers (Figure 4, Item 4), new lockwasher (Figure 4, Item 6), and nut (Figure 4, Item 7).

END OF TASK

INSTALLATION

1. Coat end of filter element (Figure 4, Item 19) with petrolatum. Install filter element (Figure 4, Item 19) in filter separator (Figure 4, Item 1) and slide into place on guide pipe.
2. Install retainer nut (Figure 4, Item 18) and hand-tighten. Do not overtighten.
3. Repeat Steps 1 and 2 to install the remaining 14 filter elements (Figure 4, Item 19).
4. Install filter assembly (Figure 4, Item 2) in filter separator (Figure 4, Item 1) with filter adapter assembly (Figure 4, Item 14) end down. Turn filter assembly (Figure 4, Item 2) so filter adapter assembly
(Figure 4, Item 14) end is toward rear of filter separator (Figure 4, Item 1).
5. Starting at upper guide rod farthest from service opening (Figure 4, Item 20), install filter assembly (Figure 4, Item 2) in filter separator (Figure 4, Item 1).
6. Repeat Steps 4 and 5 to install remaining four filter assemblies (Figure 4, Item 2).

NOTE

Hand-tighten wingnuts. DO NOT use wrench.

7. Install retaining plate (Figure 4, Item 8) on five filter assemblies (Figure 4, Item 2) and secure with seven washers (Figure 4, Item 4), new lockwashers (Figure 4, Item 6), and nuts (Figure 4, Item 7).

INSTALLATION - Continued

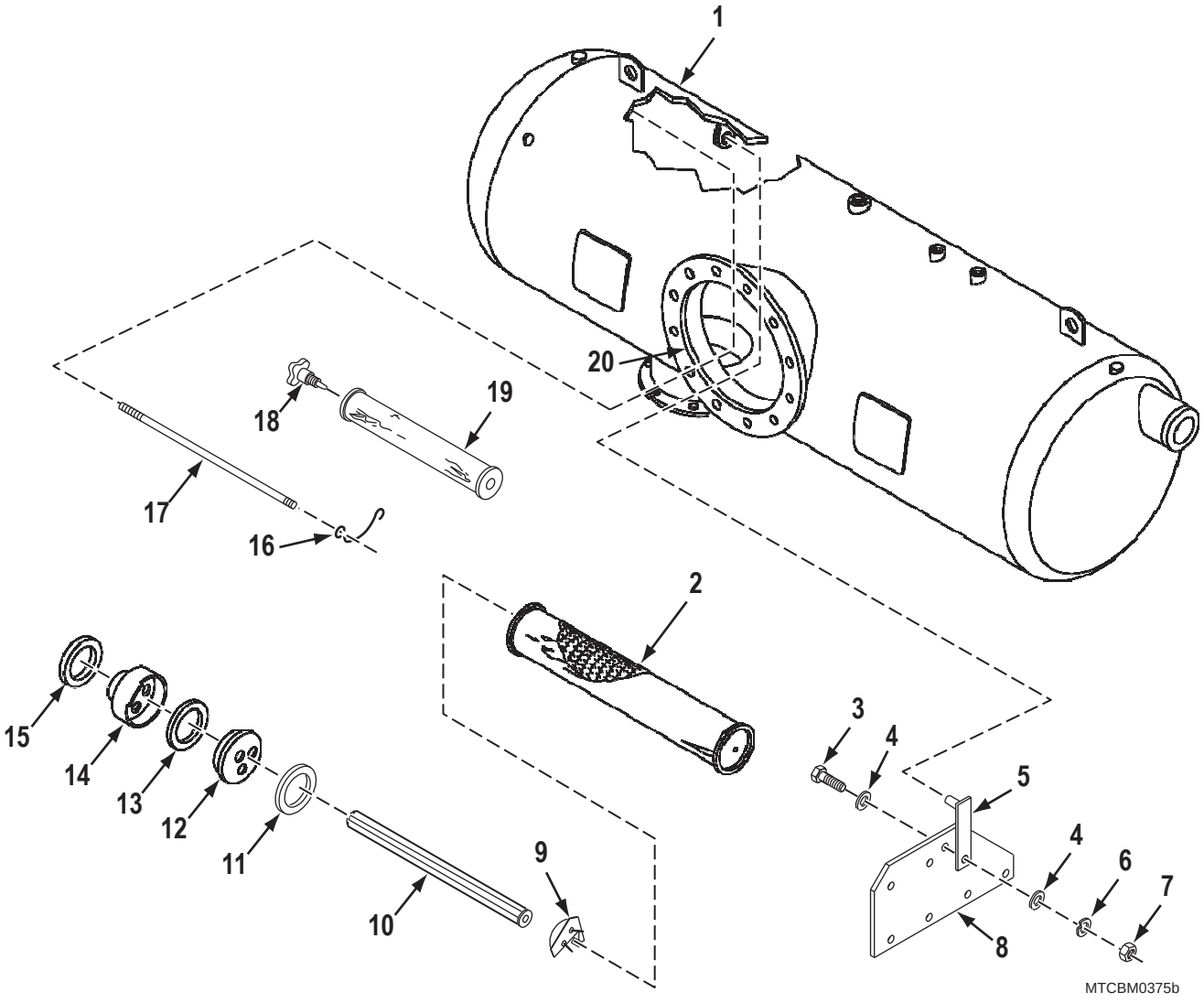


Figure 4. Filter/Separator Filter Elements Maintenance.

INSTALLATION - Continued

8. Install access cover (Figure 5, Item 6) and new gasket (Figure 5, Item 5) on mounting flange of filter separator (Figure 5, Item 4).

NOTE

Install two screws with holes in their shafts at the top and bottom of access cover so antipilferage seals can be installed.

9. Install 12 screws (Figure 5, Item 7), 24 washers (Figure 5, Item 1), 12 new lockwashers (Figure 5, Item 2), and 12 nuts (Figure 5, Item 3) on access cover (Figure 5, Item 6) and mounting flange of filter separator (Figure 5, Item 4).
10. Install new antipilferage seal through bottom pair of screws and one through top pair of screws. Trim excess wire.

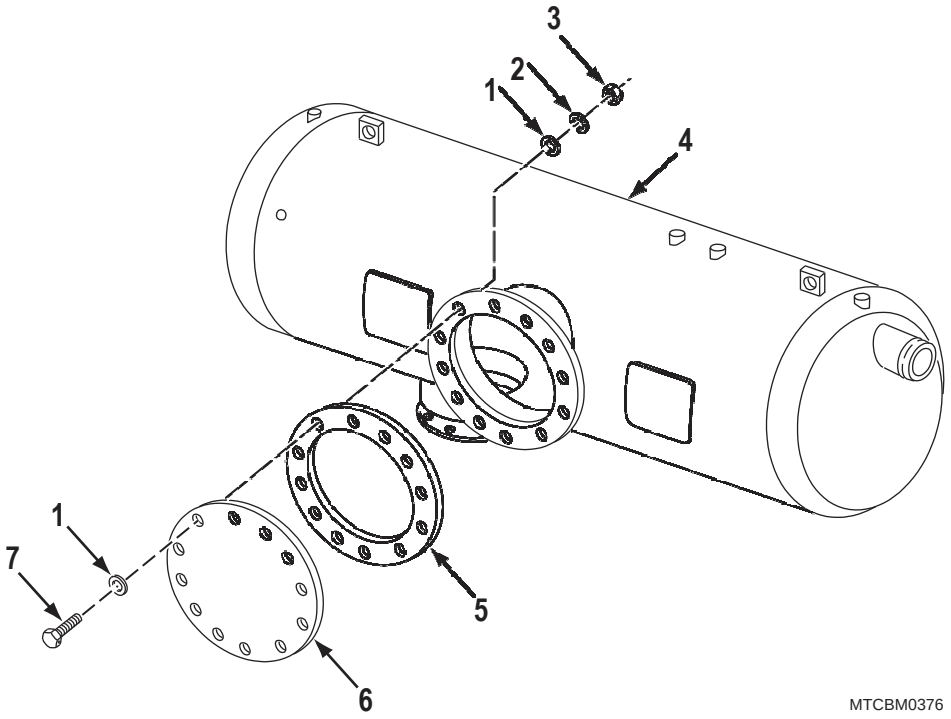


Figure 5. Access Cover Installation.

END OF TASK

FOLLOW ON TASK

1. Open all fuel dispensing valves (WP 0004).
2. Bleed fuel system (WP 0201).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
3 IN. PUMP ASSEMBLY MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Caliper, Micrometer, Inside (WP 0294, Table 1, Item 3)
- Crimping Tool, Terminal (WP 0294, Table 1, Item 2)
- Wrench, Strap (WP 0294, Table 1, Item 24)

Materials/Parts
- Gasket (WP 0295, Table 1, Item 74)
- Gasket (WP 0295, Table 1, Item 77)

Materials/Parts (cont.)
- Oil, Lubricating (WP 0293, Table 1, Item 17)
- Seal (WP 0295, Table 1, Item 60)
- Seal (WP 0295, Table 1, Item 62)
- Tape, Antiseize (WP 0293, Table 1, Item 29)
- Washer, Lock
  - Qty: (8) (WP 0295, Table 1, Item 56)
- Washer, Lock
  - Qty: (4) (WP 0295, Table 1, Item 149)

Equipment Condition
- Engine and pump cabinet removed (WP 0165)
- Semitrailer uncoupled (WP 0217)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

AIR LEAKAGE TEST

Before removal, the following test can be performed to determine whether pump or a loose connection is the cause of problem. Air leaks at the inlet of pump will cause noisy operation and decreased pump outlet. The vacuum gage from the vapor integrity test set can be used (WP 0230).

a. Remove a pipe plug in the suction side of the pump. Use pipe seal compound on the pipe threads. Install a vacuum gage in the plug.

b. Make sure the pump is filled with fluid, and start the pump.

c. At operating speed, the pump should pull a minimum of 20 in. (50.8 cm) of vacuum. This indicates that the gaskets and seals are good.

d. Stop the pump. Observe whether vacuum remains at the maximum developed by the pump. If vacuum falls off rapidly, an air leak exists. Be sure that leakage is not coming from pipe plug or vacuum
gage connection.

e. If leakage is indicated, lighten flange connections and repeat test before removing pump for repairs.

END OF TASK

DISASSEMBLY

1. Remove pipe plug (Figure 1, Item 13) on bottom of intermediate housing (Figure 1, Item 10). Drain lubricant.
2. Remove eight screws (Figure 1, Item 11) and lockwashers (Figure 1, Item 12). Discard lockwashers (Figure 1, Item 12).

CAUTION

To avoid damaging equipment, use care when separating intermediate housing and seal plate from volute. Failure to comply may result in damage to, or destruction of, equipment or mission.

3. Loosen intermediate housing (Figure 1, Item 10) from seal plate (Figure 1, Item 6). Carefully remove intermediate housing (Figure 1, Item 10) from seal plate (Figure 1, Item 6). Remove 12 nuts (Figure 1, Item 8), lockwashers (Figure 1, Item 7), gasket (Figure 1, Item 4), and impeller (Figure 1, Item 3) as an assembly from volute (Figure 1, Item 1). Discard gasket (Figure 1, Item 4) and lockwashers (Figure 1, Item 7).

NOTE

Impeller is threaded on impeller shaft. Impeller will unscrew in same direction as pump runs.

4. Put a strap wrench around discharge surface of impeller (Figure 1, Item 3) as close as possible to seal plate (Figure 1, Item 6).
5. If pump coupling (Figure 1, Item 9) was removed earlier, install pump coupling (Figure 1, Item 9) and wedge a pry bar between coupling (Figure 1, Item 9).

DISASSEMBLY - Continued

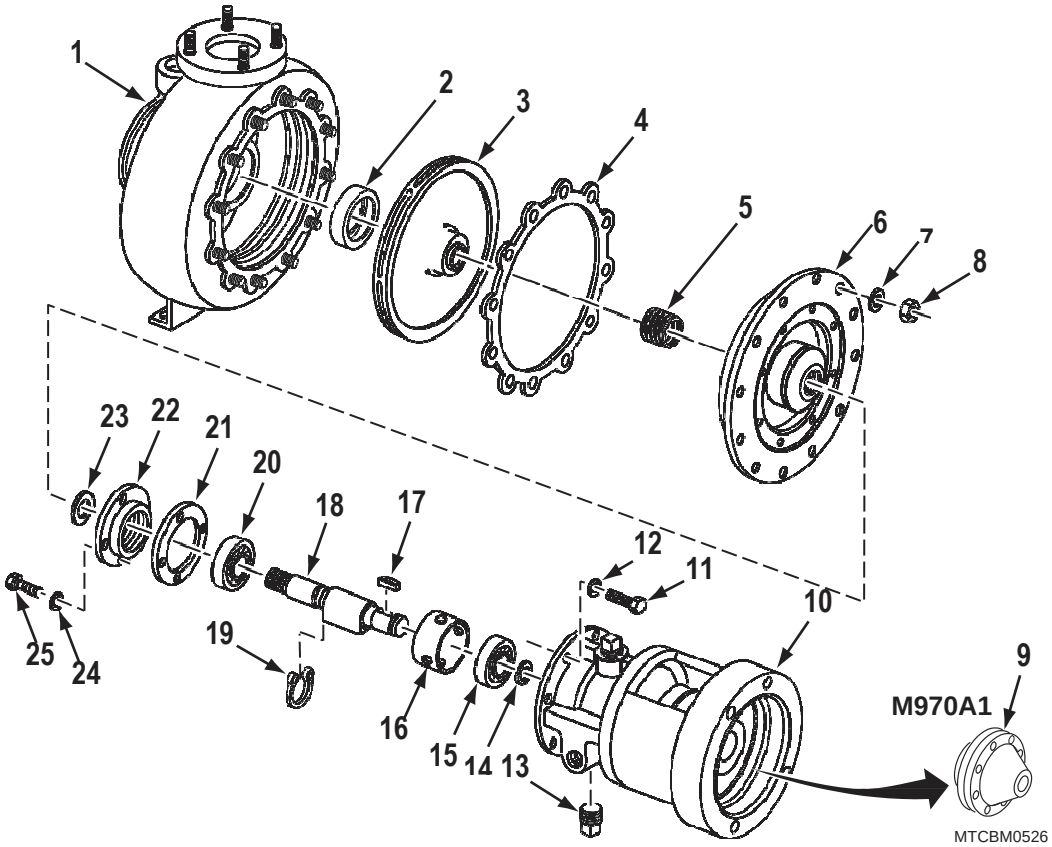
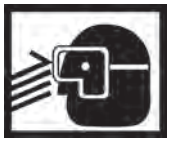


Figure 1. 3 In. Pump Disassembly.

WARNING



Be careful when removing the impeller from the pump. The spring load on the mechanical seal may cause the impeller to fly off the shaft as it is being removed. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

6. Apply force to strap wrench in a counterclockwise direction. Remove impeller (Figure 1, Item 3) from shaft (Figure 1, Item 16).
7. Pull seal plate (Figure 1, Item 6) and mechanical spring (Figure 1, Item 5) off impeller shaft (Figure 1, Item 16).
8. Remove four capscrews (Figure 1, Item 23), lockwashers (Figure 1, Item 22), and gasket (Figure 1, Item 19) from bearing cap (Figure 1, Item 20). Discard lockwashers (Figure 1, Item 22) and gasket (Figure 1, Item 19).
9. Remove pump coupling (Figure 1, Item 7) and key (Figure 1, Item 15).

DISASSEMBLY - Continued

10. Hit keyed end of shaft (Figure 2, Item 18) and remove shaft, two bearings (Figure 2, Items 15 and 20), and spacer (Figure 2, Item 16) from intermediate housing (Figure 2, Item 10).
11. Remove seal (Figure 2, Item 14) from intermediate housing (Figure 2, Item 10). Discard seal (Figure 2, Item 14).
12. Remove seal (Figure 2, Item 23) from bearings (Figure 2, Items 15 and 20) from impeller shaft (Figure 2, Item 18). Discard seal (Figure 2, Item 23).
13. Remove snap ring (Figure 2, Item 19) and bearings (Figure 2, Items 15 and 20) from impeller shaft (Figure 2, Item 18).

NOTE

Perform Step 14 only if wear ring shows signs of excessive wear.

14. Pull wear ring (Figure 2, Item 2) from volute (Figure 2, Item 1).

END OF TASK

INSPECTION AND REPAIR

1. Inspect clearance between wear plate and impeller. If clearance exceeds 0.035 in. (0.89 mm), add shims until rubbing just starts to occur when impeller and wear plate are installed. Remove enough shims to move the impeller away from the plate to a distance of 0.015 in. (0.38 mm).
2. Rotate pump by hand to make sure impeller is not binding or scraping.
3. Remove minor nicks on edges of impeller vanes.
4. After replacement of impeller, wear plate, or impeller shaft, check for clearance between the back of the impeller and the seal plate. If the impeller scrapes when the seal plate is installed, add another gasket of sufficient thickness between the seal plate and pump casting.
5. Inspect the mating surfaces of the seals for wear, scoring, grooves, or other damage that can cause leakage. If any of the seal parts are worn, replace seal. Never mix old and new parts of seals.
6. Inspect the impeller shaft for nicks, scratches, scoring or other damage. Replace the shaft if damaged.
7. Rotate bearing by hand and check for binding or wear. Replace bearings if wear is found. If the shaft is worn so the bearings slip on and off easily, the shaft must be replaced. Replace the housing if the bearings do not fit snugly into the bearing bore.

END OF TASK

ASSEMBLY

1. Install new seal (Figure 2, Item 10) in bore of intermediate housing (Figure 2, Item 9) with lip of seal toward impeller (Figure 2, Item 14).

NOTE

Loading groove in bearing must be installed toward shoulder or (largest diameter) of impeller shaft.

2. Press bearing (Figure 2, Item 5) over threaded end of impeller shaft (Figure 2, Item 6). Install snap ring (Figure 2, Item 11).
3. Put spacer (Figure 2, Item 7) onto impeller shaft (Figure 2, Item 6), against bearing (Figure 2, Item 8).

ASSEMBLY - Continued

Press bearing (Figure 2, Item 8) with loading groove toward spacer (Figure 2, Item 7) onto keyed end of shaft (Figure 2, Item 6).

4. Install impeller shaft (Figure 2, Item 6) and bearing assembly into intermediate housing (Figure 2, Item 9). Tap shaft and bearing into position.
5. Install new seal (Figure 2, Item 2) into bearing cap (Figure 2, Item 3) with lip of seal toward inside of cap.

CAUTION

Use care not to damage gasket when sliding bearing cap onto shaft. Failure to comply may result in damage to, or destruction of, equipment or mission.

6. Place new gasket (Figure 2, Item 4) on flange of bearing cap (Figure 2, Item 3). Slide bearing cap (Figure 2, Item 3) over threaded end of impeller shaft (Figure 2, Item 6).
7. Install four capscrews (Figure 2, Item 13) and new lockwashers (Figure 2, Item 12).

CAUTION

Keep seal parts free from dirt and other foreign material. Failure to comply may result in damage to, or destruction of, equipment or mission.

8. Apply light coating of lightweight oil to ring of stationary seal. Install seal assembly into seal plate (Figure 2, Item 1). Push seal assembly squarely and firmly into bore of seal plate (Figure 2, Item 1).
9. Apply light oil to surface of shaft where it will make contact with seal. Slide seal plate (Figure 2, Item 1) onto end of impeller shaft (Figure 2, Item 6). Slide rotating seal parts as far as they will go.
10. Install mechanical spring (Figure 2, Item 17), making sure it seals properly.
11. Install spring seat (Figure 2, Item 16) and impeller (Figure 2, Item 6), using shims (Figure 2, Item 15) as required to obtain proper running distance.

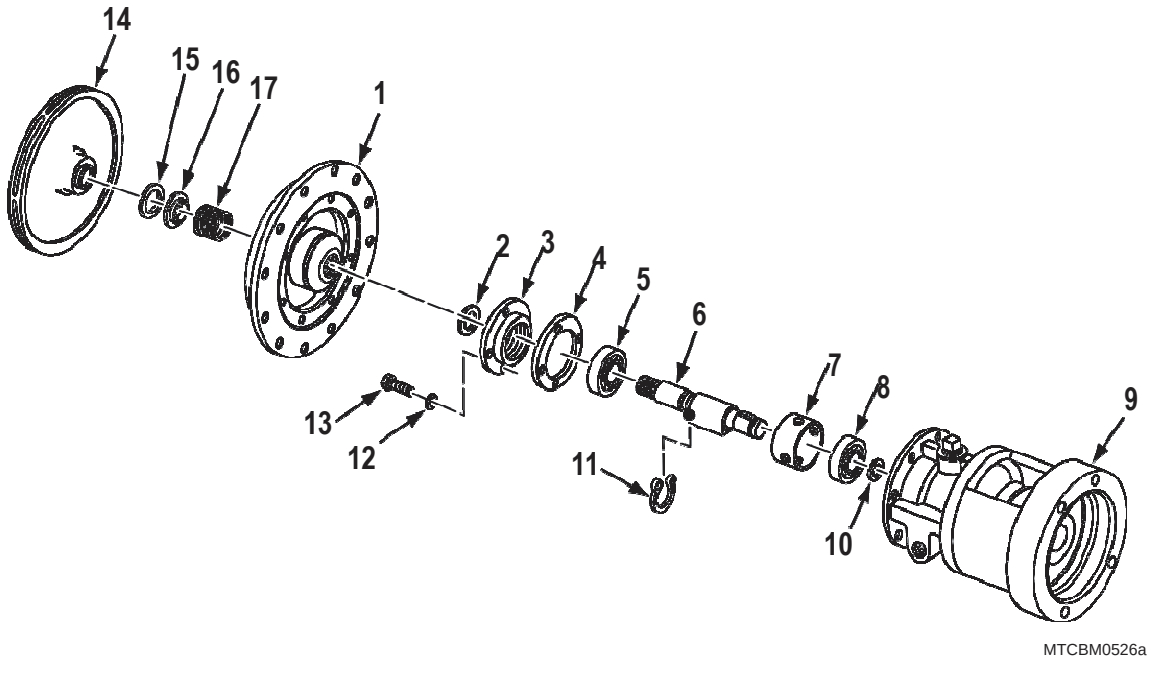


Figure 2. 3 In. Pump Assembly, View 1.

ASSEMBLY - Continued

NOTE

Perform Step 12 if installing new wear ring.

12. Install new wear ring (Figure 3, Item 2) in bore of volute (Figure 3, Item 1). Make sure wear ring is squarely and firmly seated in bore.
13. Install impeller (Figure 3, Item 5) on shaft (Figure 3, Item 13). Tighten securely.
14. Install new gasket (Figure 3, Item 3) on volute (Figure 3, Item 1).
15. Install 12 nuts (Figure 3, Item 9), new lockwashers (Figure 3, Item 8), seal plate (Figure 3, Item 12), and intermediate housing (Figure 3, Item 10) on volute (Figure 3, Item 1).
16. Rotate pump by hand to make sure impeller is not binding or scraping. Shims (Figure 3, Item 4) can be added behind impeller (Figure 3, Item 5) to center impeller in volute (Figure 3, Item 1). Clearance between front of impeller and seal plate (Figure 2, Item 12) should be equal to the clearance between the back of impeller and pump casing.
17. Install eight new lockwashers (Figure 3, Item 6) and screws (Figure 3, Item 7).
18. Install plug pipe (Figure 3, Item 11) on bottom of intermediate housing (Figure 3, Item 10). Fill with lubricant.

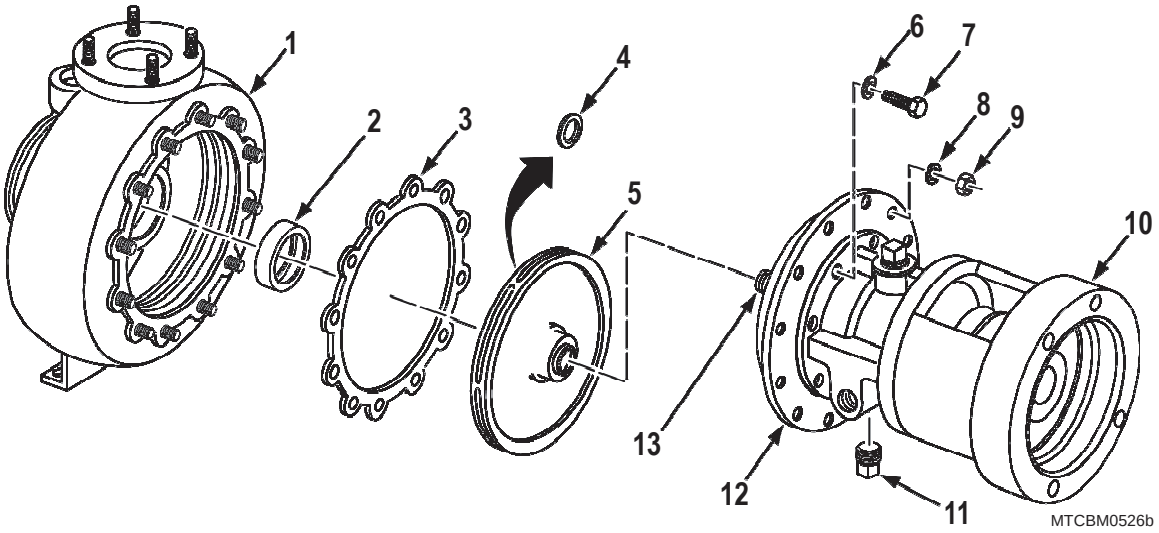


Figure 3. 3 In. Pump Assembly, View 2.

END OF TASK

FOLLOW ON TASK

Install pump and pump coupling (WP 0008).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
4 IN. PUMP ASSEMBLY MAINTENANCE (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Caliper, Micrometer, Inside (WP 0294, Table 1, Item 3)

Materials/Parts
- Gasket (WP 0295, Table 1, Item 58)
- Gasket (WP 0295, Table 1, Item 74)
- Nuts, Self-Locking
  - Qty: (4) (WP 0295, Table 1, Item 160)
- Nuts, Self-Locking
  - Qty: (4) (WP 0295, Table 1, Item 164)
- O-Ring (WP 0295, Table 1, Item 61)

Materials/Parts (cont.)
- Seal (WP 0295, Table 1, Item 62)
- Washer, Lock
  - Qty: (12) (WP 0295, Table 1, Item 148)

References
- TM 9-214
- WP 0286

Equipment Condition
- Alternator removed (WP 0008)
- Engine and pump cabinet removed (WP 0165)
- Engine fuel lines removed (WP 0202)
- Semitrailer uncoupled (WP 0217)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

AIR LEAKAGE TEST

Before removal, the following test can be performed to determine whether pump or a loose connection is the cause of problem. Air leaks at the inlet of pump will cause noisy operation and decreased pump outlet. The vacuum gage from the vapor integrity test set can be used (WP 0230).

a. Remove a pipe plug in the suction side of the pump. Use pipe seal compound on the pipe threads. Install a vacuum gage in the plug.

b. Make sure the pump is filled with fluid, and start the pump.

c. At operating speed, the pump should pull a minimum of 20 in. (51 cm) of vacuum. This indicates that the gaskets and seals are good.

d. Stop the pump. Observe whether vacuum remains at the maximum developed by the pump. If vacuum falls off rapidly, an air leak exists. Be sure that leakage is not coming from pipe plug or vacuum gage connection.

e. If leakage is indicated, tighten flange connections and repeat test before removing pump for repairs.

END OF TASK

REMOVAL

1. Remove pipe plug (Figure 1, Item 5) and drain lubricant.

NOTE

Remove alternator ground wire from bottom center of firewall.

2. Remove six screws (Figure 1, Item 2) and lockwashers (Figure 1, Item 3) connecting intermediate housing (Figure 1, Item 1) to engine (Figure 1, Item 4). Discard lockwashers (Figure 1, Item 3).

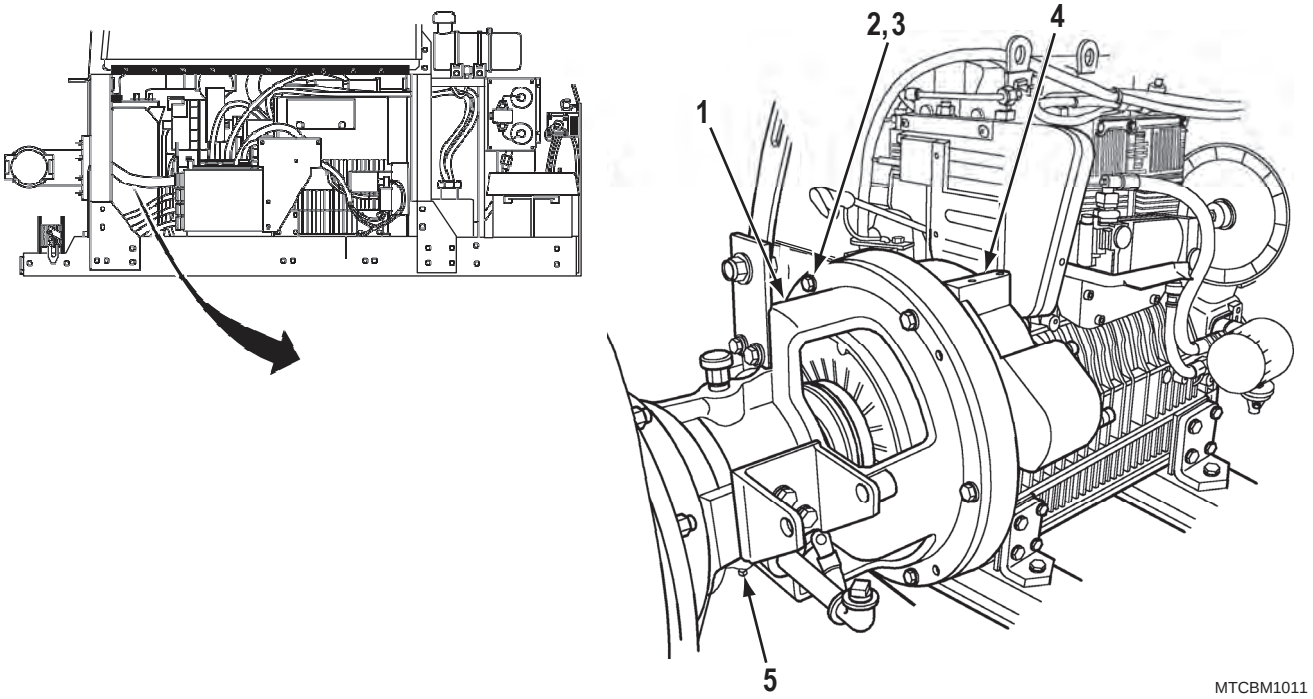

Figure 1. Intermediate Housing Removal.

REMOVAL - Continued

3. Remove two self-locking nuts (Figure 2, Item 2), washers (Figure 2, Item 3), and bolts (Figure 2, Item 4) at bottom of pump (Figure 2, Item 1). Discard self-locking nuts (Figure 2, Item 2).

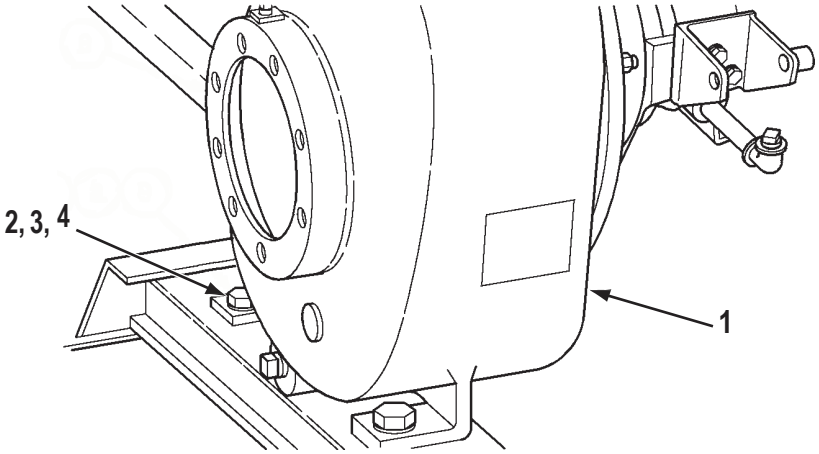

Figure 2. Pump Removal.

NOTE

If installing same pump, use same shims and mark the location and number of the shims used in the mounting of the pump.

4. Remove pump (Figure 3, Item 6) and intermediate housing (Figure 3, Item 1) from cabinet frame (Figure 3, Item 10).

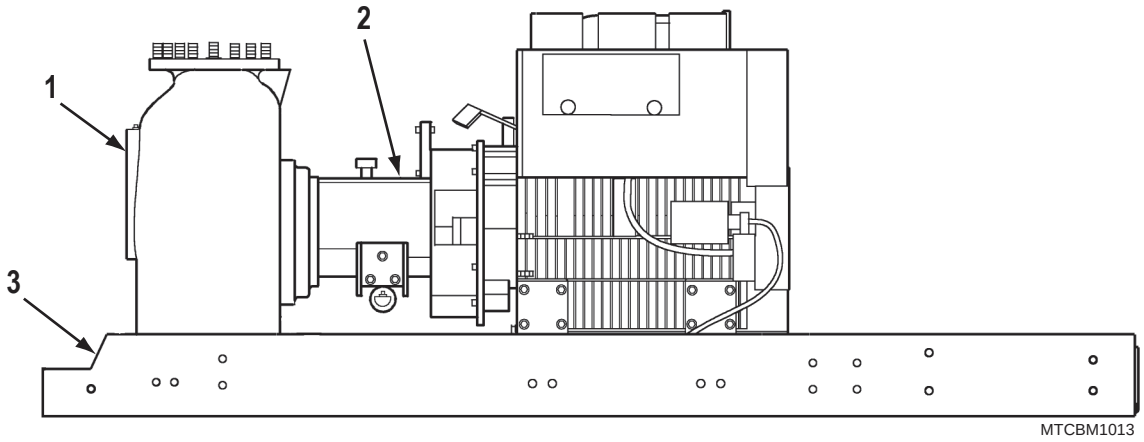

Figure 3. Cabinet Frame Removal.

END OF TASK

DISASSEMBLY

1. Remove eight nuts (Figure 4, Item 3), lockwashers (Figure 4, Item 4), intermediate housing (Figure 4, Item 2), and gasket(s) (Figure 4, Item 5) from pump (Figure 4, Item 1) as an assembly. Discard lockwashers (Figure 1, Item 4) and gasket(s) (Figure 1, Item 5).

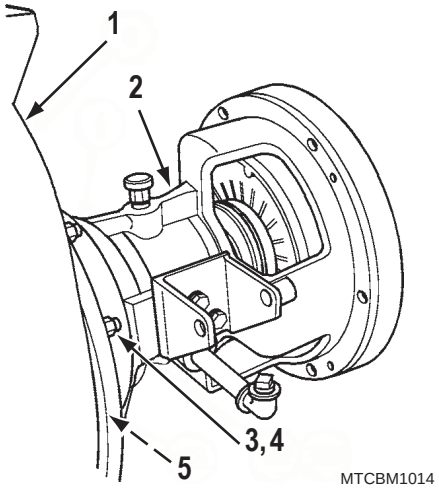

Figure 4. Intermediate Housing Disassembly.

WARNING

Be careful when removing the impeller from the pump. The spring load on the mechanical seal may cause the impeller to fly off the shaft as it is being removed. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

2. Remove impeller (Figure 5, Item 6) from impeller shaft (Figure 5, Item 16) by unscrewing it in the same direction as pump turns.
3. Remove seal plate (Figure 5, Item 10), mechanical seal (Figure 5, Item 9), spring seat (Figure 5, Item 8), and shims (Figure 5, Item 7) from impeller shaft (Figure 5, Item 16). Discard mechanical seal (Figure 5, Item 9).
4. Remove four screws (Figure 5, Item 23), lockwashers (Figure 5, Item 22), bearing cap (Figure 5, Item 20), gasket (Figure 5, Item 19), and shims (Figure 5, Item 18). Discard lockwashers (Figure 5, Item 22) and gasket (Figure 5, Item 19).
5. Remove pump coupling (Figure 5, Item 11) and key (Figure 5, Item 15) from impeller shaft (Figure 5, Item 16).
6. Remove impeller shaft (Figure 5, Item 16) and bearings (Figure 5, Item 14) from intermediate housing (Figure 5, Item 12) as an assembly by using a soft hammer to hit the keyed end of the impeller shaft (Figure 5, Item 16).
7. Remove seal (Figure 5, Item 13) from intermediate housing (Figure 5, Item 12). Discard seal (Figure 5, Item 13).

DISASSEMBLY - Continued

8. Remove seal (Figure 5, Item 21) from bearing cap (Figure 5, Item 20). Discard seal (Figure 5, Item 21).
9. Remove snap ring (Figure 5, Item 17) and two bearings (Figure 5, Item 14) from impeller shaft (Figure 5, Item 16).

NOTE

Perform Step 10 only if inspection of wear plate requires replacement.

10. Remove two nuts (Figure 5, Item 26), lockwashers (Figure 5, Item 25), and wear plate (Figure 5, Item 5) from volute (Figure 5, Item 3). Discard lockwashers (Figure 5, Item 25).
11. Remove eight studs (Figure 5, Item 4) from volute (Figure 5, Item 3).
12. Remove three plugs (Figure 5, Items 1, 2, and 24).

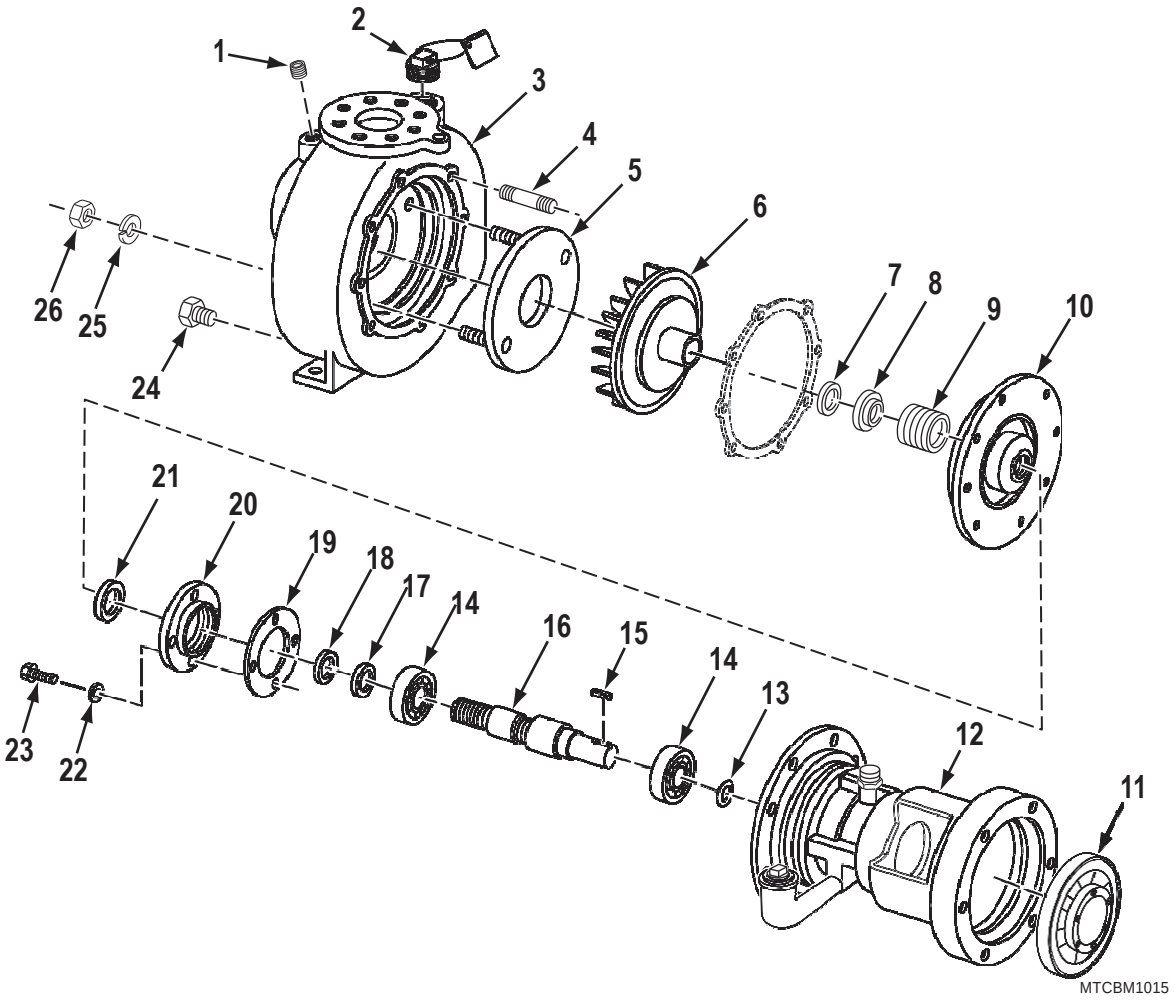

Figure 5. 4 in. Pump Disassembly.

END OF TASK

CLEANING

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Clean shaft and all component parts (except bearings) with a soft cloth soaked in cleaning solvent. Inspect parts for wear or damage and replace as necessary.

END OF TASK

INSPECTION AND REPAIR

1. Remove minor nicks on edges of impeller vanes.
2. Replace all seals, gaskets, and bearings.
3. Inspect impeller shaft for nicks, scratches, scoring, or other damage. Replace shaft if damaged.
4. If shaft is worn so bearings slip on and off easily, shaft must be replaced. Replace housing if bearings do not fit snugly into bearing bore.

END OF TASK

ASSEMBLY

1. Install three plugs (Figure 6, Items 1, 2, and 18) in volute (Figure 6, Item 3) and plug (Figure 6, Item 7) in intermediate housing (Figure 6, Item 6).
2. Install eight studs (Figure 6, Item 4) in volute (Figure 6, Item 3).
3. Install wear plate (Figure 6, Item 5) to volute (Figure 6, Item 3) with two new lockwashers (Figure 6, Item 19) and nuts (Figure 6, Item 20).
4. Install two bearings (Figure 6, Item 9), and snap ring (Figure 6, Item 11) to impeller shaft (Figure 6, Item 10).
5. Install new seal (Figure 6, Item 15) in bearing cap (Figure 6, Item 14). Lip of seal must be towards inside of cap.
6. Install new seal (Figure 6, Item 8) in intermediate housing (Figure 6, Item 6).
7. Install bearings (Figure 6, Item 9) and impeller shaft (Figure 6, Item 10) in intermediate housing (Figure 6, Item 6) as an assembly.
8. Install shims (Figure 6, Item 12), new gasket (Figure 6, Item 13), bearing cap (Figure 6, Item 14), four new lockwashers (Figure 6, Item 16), and screws (Figure 6, Item 17) to intermediate housing (Figure 6, Item 6).

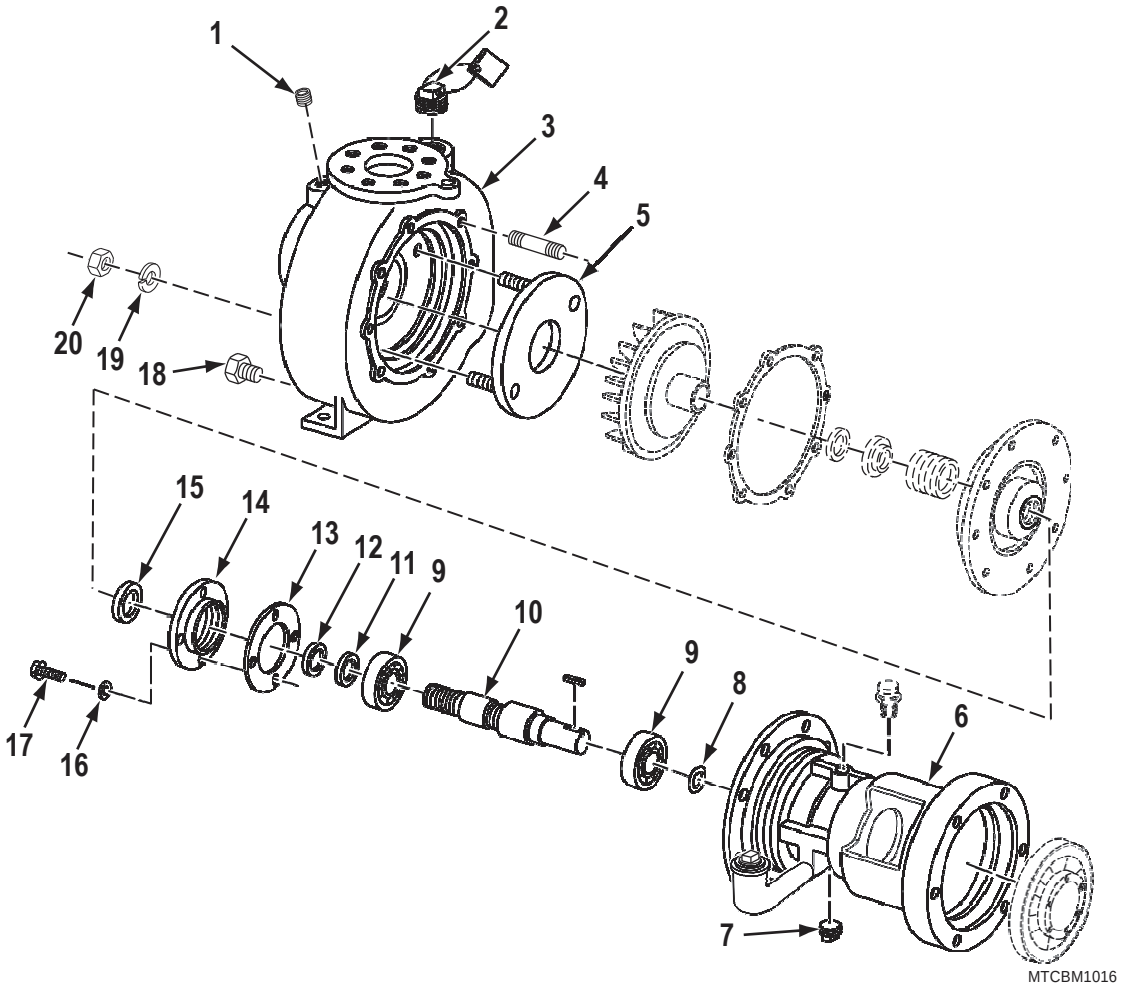

Figure 6. 4 in. Pump Assembly.

ASSEMBLY - Continued

9. Install pump coupling (Figure 7, Item 6) and key (Figure 7, Item 8) to impeller shaft (Figure 7, Item 8).
10. Install shims (Figure 7, Item 2), spring seat (Figure 7, Item 3), new mechanical seal (Figure 7, Item 4), and seal plate (5) to impeller shaft (Figure 7, Item 8).
11. Install impeller (Figure 7, Item 1) to impeller shaft (Figure 7, Item 8).

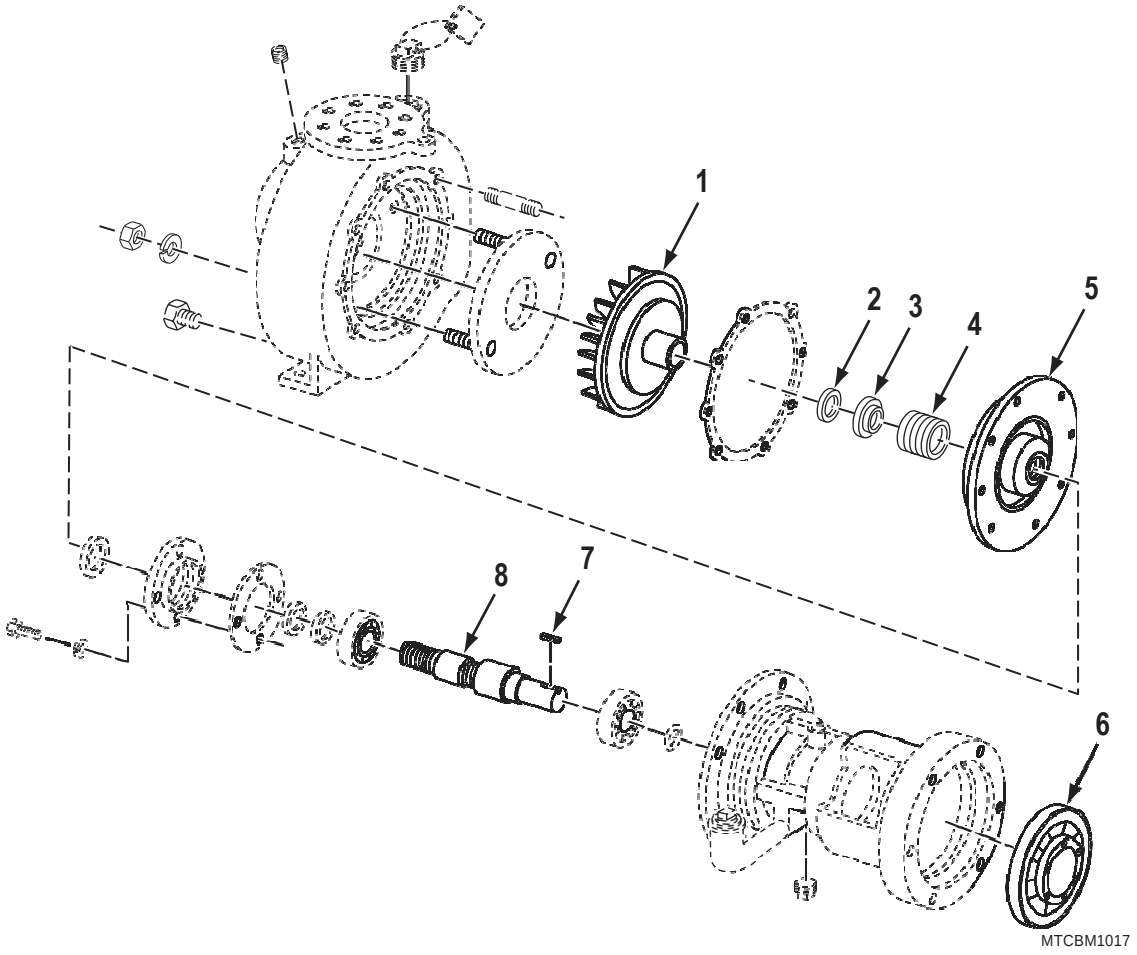

Figure 7. Impeller Installation.

NOTE

Rotate pump by hand to ensure impeller is not binding. If the impeller scrapes when pump is rotated, remove and add another gasket of sufficient thickness between the seal plate and pump casting.

12. Install new gasket(s) (Figure 8, Item 5), intermediate housing (Figure 8, Item 2), eight new lockwashers (Figure 8, Item 4), and nuts (Figure 8, Item 3) to pump (Figure 8, Item 1) as an assembly.

ASSEMBLY - Continued

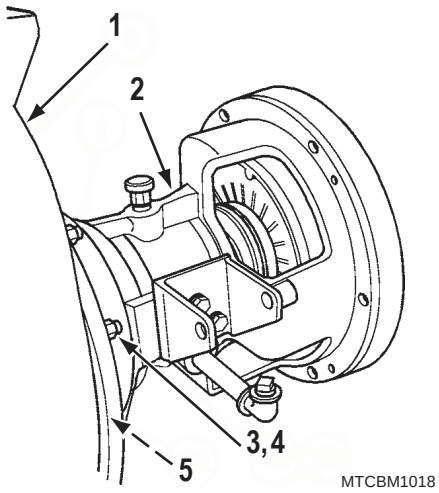

Figure 8. Intermediate Housing Assembly.

13. Check for clearance between front of impeller (Figure 9, Item 3) and wear plate (Figure 9, Item 2). If impeller scrapes, add another gasket (Figure 9, Item 4) of sufficient thickness between seal plate (Figure 9, Item 5) and volute (Figure 9, Item 1).

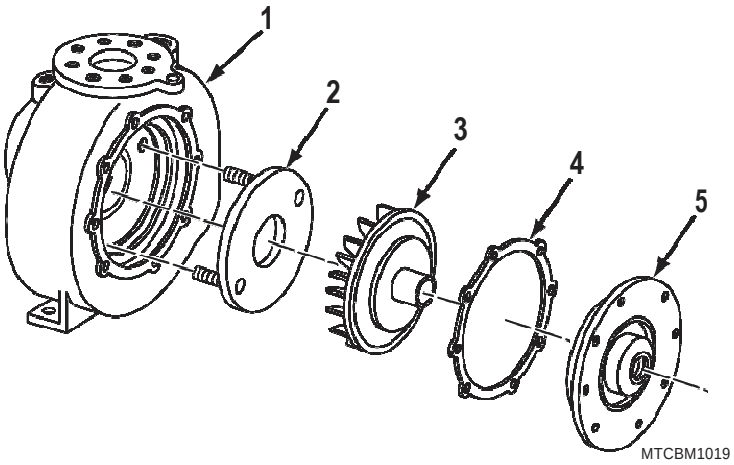

Figure 9. Volute Assembly.

END OF TASK

INSTALLATION

1. Install pump (Figure 10, Item 1) and intermediate housing (Figure 10, Item 2) to cabinet frame (Figure 10, Item 3).

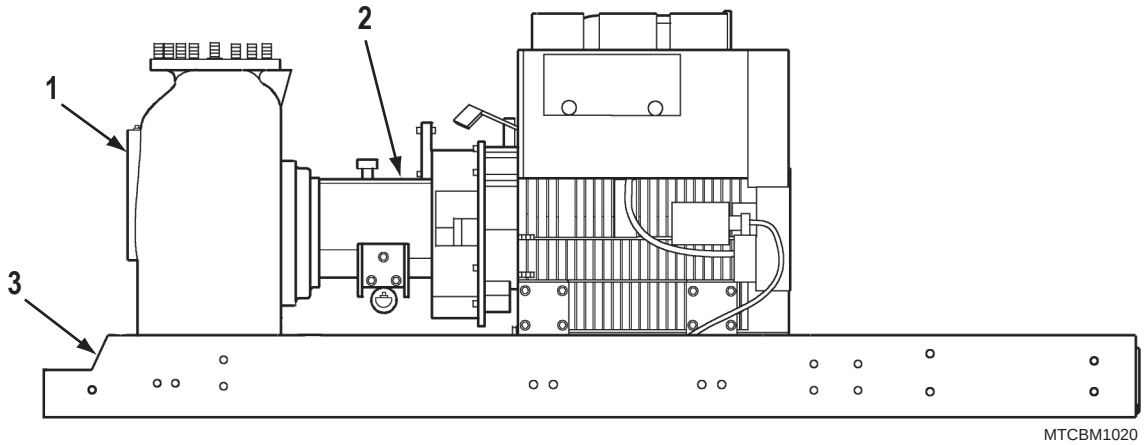

Figure 10. Cabinet Frame Installation.

2. Install six screws (Figure 11, Item 2) and new lockwashers (Figure 11, Item 3) connecting intermediate housing (Figure 11, Item 1) to engine (Figure 11, Item 4).

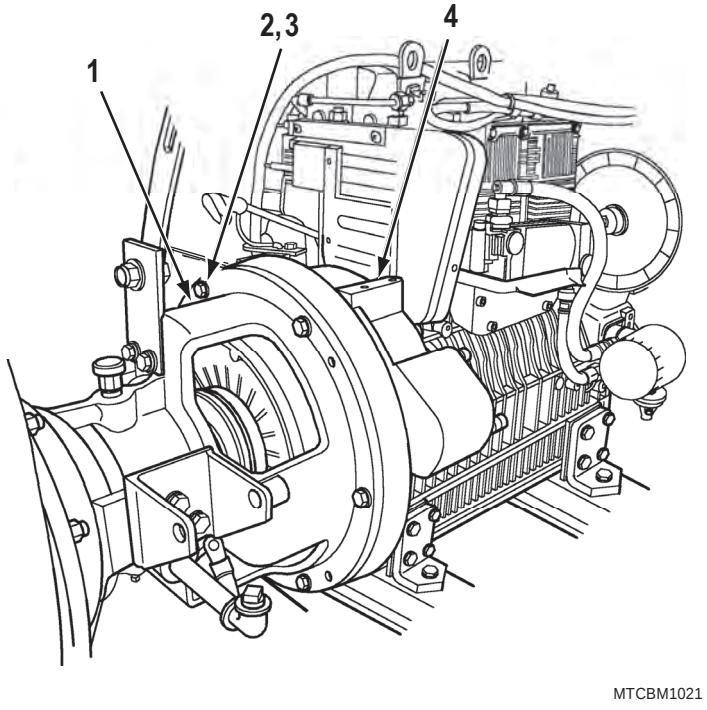

Figure 11. Intermediate Housing Installation.

INSTALLATION - Continued

3. Install shim pack in location from where it was removed.
4. Install two bolts (Figure 12, Item 3), washers (Figure 12, Item 2), and new self-locking nuts (Figure 12, Item 1) through pump mounts to cabinet frame (Figure 12, Item 5).
5. Fill intermediate housing (Figure 12, Item 4) with oil. Refer to lube instructions (WP 0286).

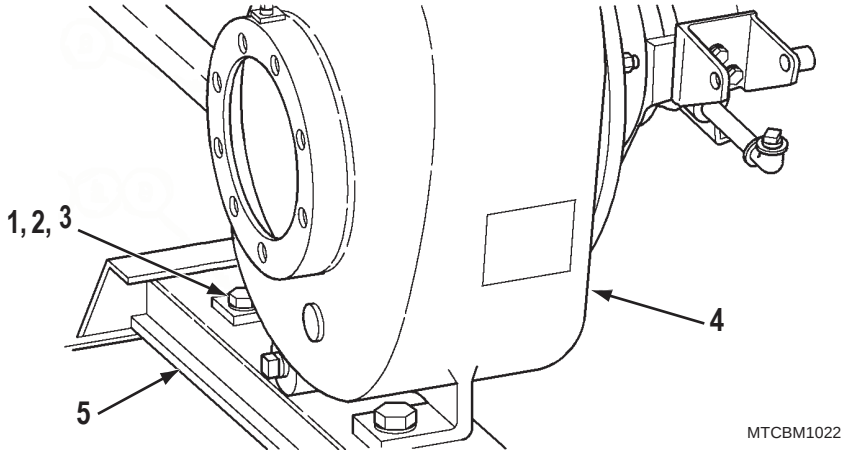

Figure 12. Pump Installation.

END OF TASK

FOLLOW ON TASK

1. Install fuel lines on engine fuel pump (WP 0202).
2. Lubricate 4 in. pump (WP 0286).
3. Install alternator (WP 0217).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
3 IN PUMP COUPLING MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)
3 in. pump assembly removed (WP 0110)

DISASSEMBLY

NOTE

Ensure woodruff key is not lost during disassembly.

1. Remove two caps (Figure 1, Item 2), set screws (Figure 1, Item 3), and 3 in. coupling assembly (Figure 1, Item 4), from 3 in. pump assembly (Figure 1, Item 1).

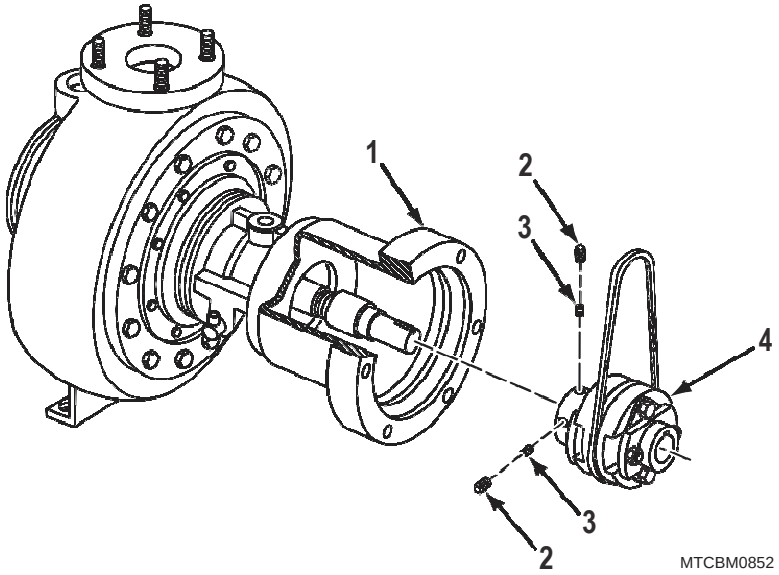

Figure 1. 3 In. Coupling Disassembly.

DISASSEMBLY - Continued

2. Remove two screws (Figure 2, Item 1), washers (Figure 2, Item 2), and flex coupling (Figure 2, Item 3) from pully spacer (Figure 2, Item 4).
3. Remove two screws (Figure 2, Item 1), washers (Figure 2, Item 2), nut (Figure 2, Item 6), and flex coupling (Figure 2, Item 3), from hub end (Figure 2, Item 8).
4. Remove two screws (Figure 2, Item 5), washers (Figure 2, Item 2), and flex coupling (Figure 2, Item 3) from pully spacer (Figure 2, Item 4).
5. Remove two screws (Figure 2, Item 5), washers (Figure 2, Item 2), nut (Figure 2, Item 6), and flex coupling (Figure 2, Item 3), from hub end (Figure 2, Item 7).

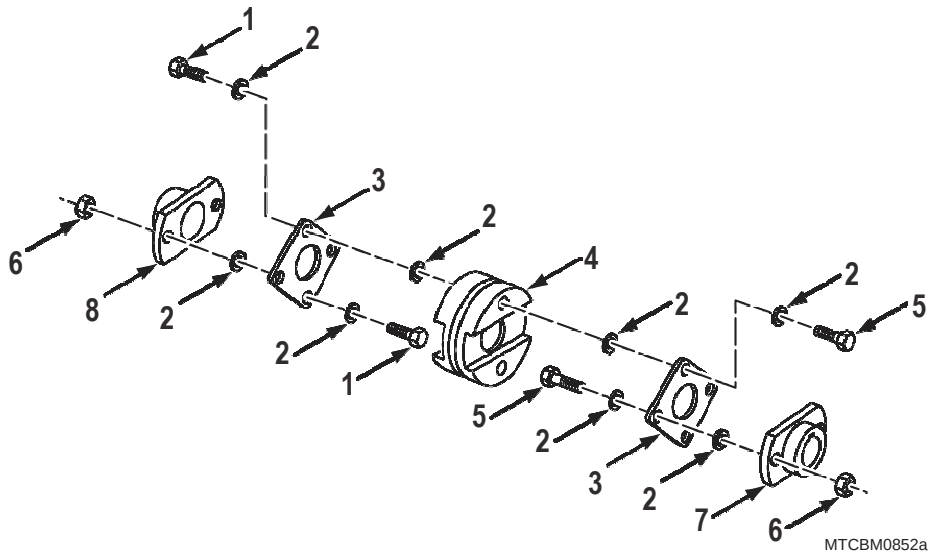

Figure 2. 3 In. Coupling Maintenance.

END OF TASK

INSPECTION

Inspect flex coupling, pully spacer and hub ends for damage. Replace as necessary.

END OF TASK

ASSEMBLY

1. Install flex coupling (Figure 2, Item 3), nut (Figure 2, Item 6), two washers (Figure 2, Item 2), and screws (Figure 2, Item 5) to hub end (Figure 2, Item 7).
2. Install flex coupling (Figure 2, Item 3), two washers (Figure 2, Item 2), and screws (Figure 2, Item 5) to pully spacer (Figure 2, Item 4).
3. Install flex coupling (Figure 2, Item 3), nut (Figure 2, Item 6), two washers (Figure 2, Item 2), and screws (Figure 2, Item 1) to hub end (Figure 2, Item 8).
4. Install flex coupling (Figure 2, Item 3), two washers (Figure 2, Item 2), and screws (Figure 2, Item 1) to pully spacer (Figure 2, Item 4).

ASSEMBLY - Continued

5. Install key (Figure 3, Item 2), 3 in. coupling assembly (Figure 3, Item 5), two set screws (Figure 3, Item 4), and two caps (Figure 3, Item 3) to 3 in. pump assembly (Figure 3, Item 1).

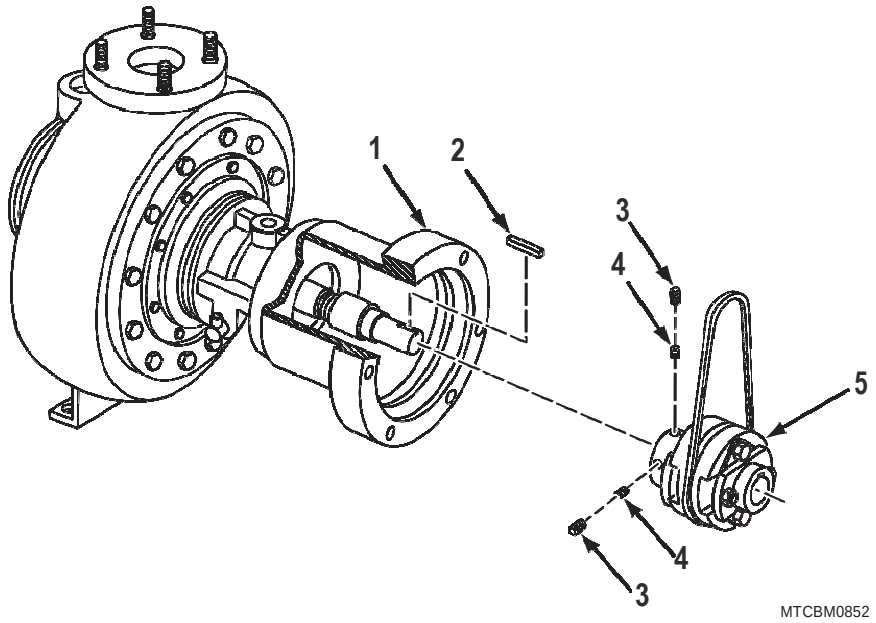

Figure 3. 3 In. Coupling Assembly.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
4 IN. PUMP COUPLING MAINTENANCE (M967A1, M969A1, AND M969A2) (LOMBARDINI)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Washer, Lock
Qty: (3) (WP 0295, Table 1, Item 147)
Washer, Lock
Qty: (8) (WP 0295, Table 1, Item 195)

Equipment Condition
Semitrailer uncoupled (WP 0007)
4 in. pump assembly removed (WP 0240)

DISASSEMBLY

1. Remove eight screws (Figure 1, Item 7), lockwashers (Figure 1, Item 6), and hub body (Figure 1, Item 3) from coupling (Figure 1, Item 2). Discard lockwashers (Figure 1, Item 6).
2. Remove three screws (Figure 1, Item 4), lockwashers (Figure 1, Item 5), coupling (Figure 1, Item 2), and bushing (Figure 1, Item 1) from pulley (Figure 1, Item 8). Discard lockwashers (Figure 1, Item 5).

END OF TASK

ASSEMBLY

1. Install pulley (Figure 1, Item 8) and bushing (Figure 1, Item 1) to coupling (Figure 1, Item 2) with three screws (Figure 1, Item 4) and new lockwashers (Figure 1, Item 5)
2. Install hub body (Figure 1, Item 3) to coupling (Figure 1, Item 2) with eight screws (Figure 1, Item 7) and new lockwashers (Figure 1, Item 6).

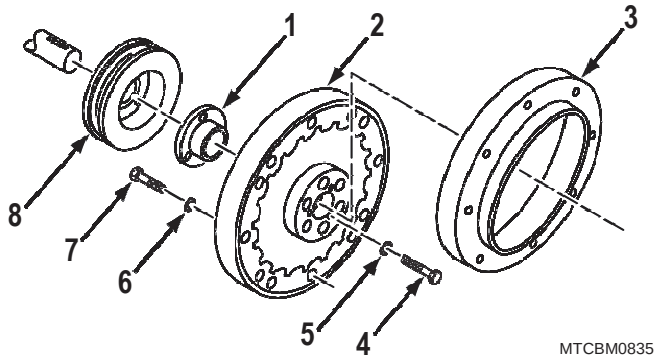

Figure 1. 4 In. Pump Coupling Maintenance.

END OF TASK

FOLLOW ON TASK

Install 4 in. pump assembly (WP 0240).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
VOLUMETRIC METER ASSEMBLY REPLACEMENT (M969A1 AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 20)
Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
Gasket, Paper
Qty: (2) (WP 0295, Table 1, Item 40)
Petrolatum (WP 0293, Table 1, Item 19)
Washer, Lock

Materials/Parts (cont.)
Qty: (11) (WP 0295, Table 1, Item 56)

Personnel Required
Two

Equipment Condition
Negative battery cable disconnected (WP 0098)
Semitrailer uncoupled (WP 0007)

WARNING

- Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Meter assembly weighs 125 lbs (57 kg). To prevent injury to personnel, two persons are required when removing meter assembly. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

There are two volumetric assemblies. This removal of the assembly is the same for both.

REMOVAL

1. Remove two nuts (Figure 1, Item 13) and two bolts (Figure 1, Item 14) from outlet pipe (Figure 1, Item 15).
2. Remove three screws (Figure 1, Item 6), lockwashers (Figure 1, Item 7), washers (Figure 1, Item 8), spacers (Figure 1, Item 9), and volumetric meter assembly (Figure 1, Item 1) from hose reel cabinet (Figure 1, Item 10). Discard lockwashers (Figure 1, Item 7).
3. Remove four nuts (Figure 1, Item 11), four lockwashers (Figure 1, Item 12), gasket (Figure 1, Item 16), and outlet pipe (Figure 1, Item 15) from meter assembly (Figure 1, Item 1). Discard lockwashers (Figure 1, Item 12) gasket (Figure 1, Item 16).
4. Remove four nuts (Figure 1, Item 4), four lockwashers (Figure 1, Item 5), gasket (Figure 1, Item 2), and elbow flange (Figure 1, Item 3) from meter assembly (Figure 1, Item 1). Discard lockwashers (Figure 1, Item 5) and gasket (Figure 1, Item 2).

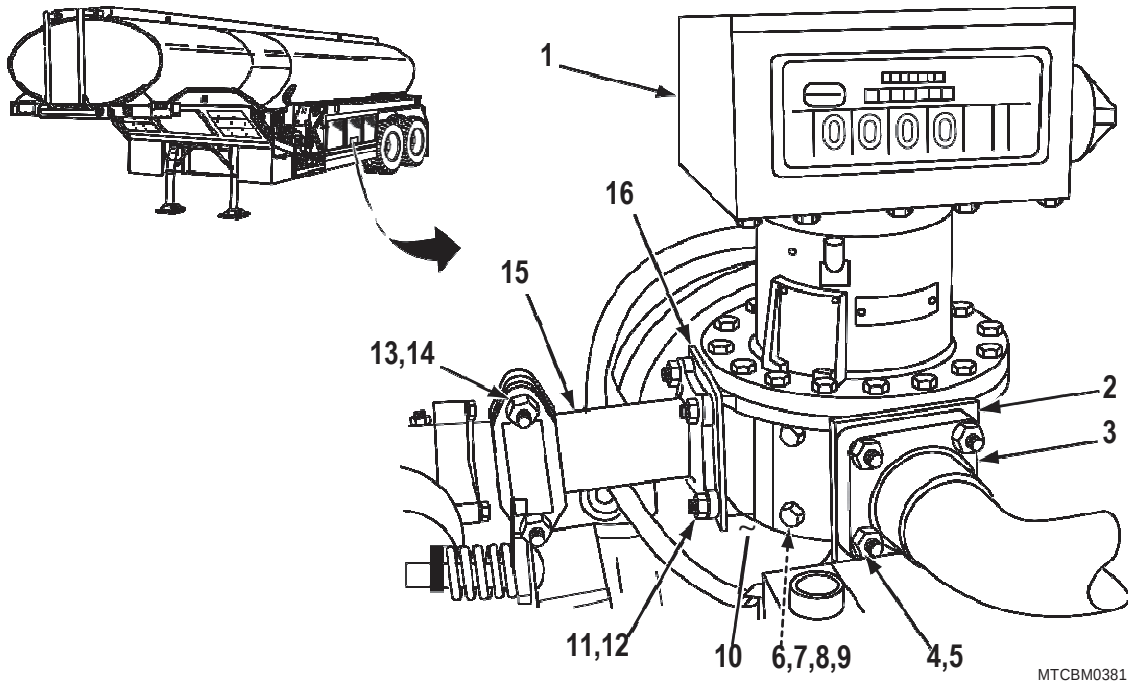

Figure 1. Volumetric Meter Assembly Replacement.

END OF TASK

INSTALLATION

1. Install elbow flange (Figure 1, Item 3), new gasket (Figure 1, Item 2), four new lockwashers (Figure 1, Item 5), and four nuts (Figure 1, Item 4) on volumetric meter assembly (Figure 1, Item 1). Torque nuts (Figure 1, Item 4) between 50-70 lb ft (67-95 N·m).
2. Install outlet pipe (Figure 1, Item 15), new gasket (Figure 1, Item 16), four new lockwashers (Figure 1, Item 12), and four nuts (Figure 1, Item 11) on meter assembly (Figure 1, Item 1). Torque nuts (Figure 1, Item 11) between 50-70 lb ft (67-95 N·m).
3. Install meter assembly (Figure 1, Item 1) in hose reel cabinet (Figure 1, Item 10) with three spacers (Figure 1, Item 9), washers (Figure 1, Item 8), new lockwashers (Figure 1, Item 7), and screws (Figure 1, Item 6).

INSTALLATION - Continued

4. Lubricate new gaskets (Figure 1, Items 2 and 16) with petrolatum.
5. Install two nuts (Figure 1, Item 13), two bolts (Figure 1, Item 14), and outlet pipe (Figure 1, Item 15). Torque nuts (Figure 1, Item 13) between 57-63 lb ft (77-85 N·m).

END OF TASK

FOLLOW ON TASK

Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
VOLUMETRIC METER ASSEMBLY REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
- Coupling, Clamp, Pipe (WP 0295, Table 1, Item 9)
- Coupling, Clamp, Pipe (WP 0295, Table 1, Item 153)
- Nuts, Self-Locking Qty: (4)

Materials/Parts (cont.)
- (WP 0295, Table 1, Item 173)
- O-Ring (WP 0295, Table 1, Item 46)
- Petrolatum (WP 0293, Table 1, Item 19)

Personnel Required
- Two

Equipment Condition
- Negative battery cable disconnected (WP 0098)
- Semitrailer bonded and grounded (WP 0008)
- Semitrailer uncoupled (WP 0007)

WARNING

Meter assembly weighs 125 lbs (57 kg). To prevent injury to personnel, two persons are required when removing meter assembly. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove split couplings (Figure 1, Items 4 and 7) from flanged nipples (Figure 1, Item 1) on both sides of meter (Figure 1, Item 2). Slide coupling seal onto pipe ends away from meter (Figure 1, Item 2). Discard split couplings (Figure 1, Items 4 and 7) and seals.
2. At rear of meter (Figure 1, Item 2), remove four nuts from studs on meter inlet (Figure 1, Item 3).
3. Remove four mounting screws (Figure 1, Item 6), self-locking nuts (Figure 1, Item 5), and meter (Figure 1, Item 2). Discard self-locking nuts (Figure 1, Item 5).

NOTE

Do Step 4 only if replacing damaged flanged nipples.

4. Remove flanged nipples (Figure 1, Item 1) on meter inlet and outlet ports.

END OF TASK

INSTALLATION

1. If removed, install flanged nipples (Figure 1, Item 1) on outlet port of meter (Figure 1, Item 2).
2. Install flange on meter with four capscrews and new lockwashers. Torque capscrews to 50-70 lb ft (67.8-94.9 N·m).
3. Coat new seal with petrolatum and install seal over studs on meter inlet port.
4. Position meter (Figure 1, Item 2) in cabinet and install four nuts connecting meter to inlet piping. Torque nuts to 50-70 lb ft (67.8-94.9 N·m).
5. Install four mounting screws (Figure 1, Item 6) and new self-locking nuts (Figure 1, Item 5). Torque nuts to 67-74 lb ft (90.8-100.3 N·m).
6. Install new split couplings (Figure 1, Items 4 and 7). Torque split coupling (Figure 1, Item 7) to 57-63 lb ft (77.3-85.4 N·m). Torque split coupling (Figure 1, Item 4) to 90-105 lb ft (122-142.4 N·m).

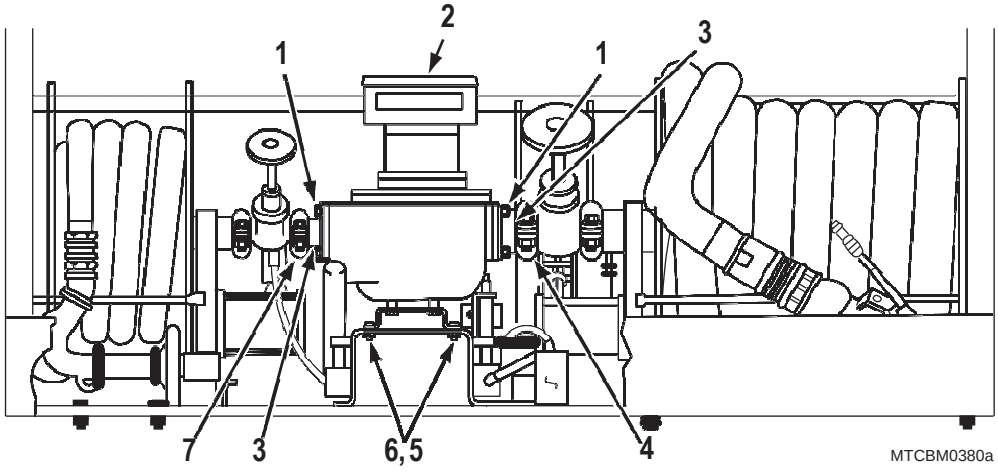

Figure 1. Volumetric Meter Assembly Installation.

END OF TASK

FOLLOW ON TASK

Connect negative battery cable (WP 0098).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
PIPING FRAME ASSEMBLY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0008
WP 0158

Materials/Parts
Nut, Self Locking
Qty: (18) (WP 0295, Table 1, Item 160)
Nut, Self Locking
Qty: (2) (WP 0295, Table 1, Item 166)

Equipment Condition
Control panel assembly removed (WP 0095)
Emergency valve A control lever removed (WP 0281)
Semitrailer uncoupled (WP 0007)
Semitrailer bonded and grounded (WP 0008)

Personnel Required
Two

WARNING

Piping frame assembly weighs 100 lbs (45 kg) and can cause injury to personnel if it should fall. An assistant is required to remove and install piping frame assembly on semitrailer. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

REMOVAL

1. Remove two screws (Figure 1, Item 6) and self-locking nuts (Figure 1, Item 3) and panel (Figure 1, Item 1) from piping frame assembly (Figure 1, Item 5). Discard self-locking nuts (Figure 1, Item 3).
2. Remove 18 screws (Figure 1, Item 2) and self-locking nuts (Figure 1, Item 4). Discard self-locking nuts (Figure 1, Items 3 and 4).
3. With the aid of an assistant, remove piping frame assembly (Figure 1, Item 5) from semitrailer.

END OF TASK

INSTALLATION

1. With the aid of an assistant, install piping frame assembly (Figure 1, Item 5) on semitrailer with 18 screws (Figure 1, Item 2) and new self-locking nuts (Figure 1, Items 3 and 4).
2. Install panel (Figure 1, Item 1) on piping frame assembly (Figure 1, Item 5) with two screws (Figure 1, Item 6) and new self-locking nuts (Figure 1, Item 3).

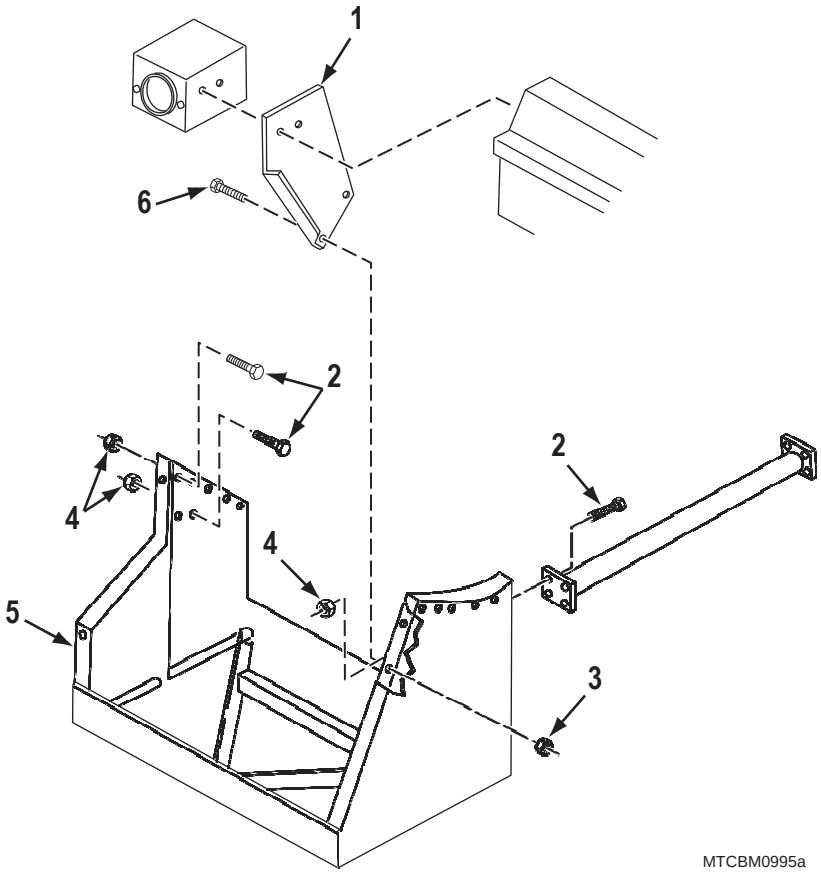

Figure 1. Piping Frame Assembly Replacement.

END OF TASK

FOLLOW ON TASK

1. Install control panel assembly (WP 0095).
2. Install Emergency Valve A control lever (WP 0281).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
EMERGENCY VALVE AND FLOAT PIPING REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Seal Qty: (4) (WP 0295, Table 1, Item 16)

Equipment Condition
Tank drained (WP 0012)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove two screws (Figure 1, Item 19), nuts (Figure 1, Item 18), coupling (Figure 1, Item 17), seal (Figure 1, Item 20), and float piping (Figure 1, Item 1) from control valve assembly (Figure 1, Item 16). Discard seal (Figure 1, Item 20).
2. Remove two screws (Figure 1, Item 3), nuts (Figure 1, Item 4), coupling (Figure 1, Item 2), seal (Figure 1, Item 5), and float piping (Figure 1, Item 1) from pipe (Figure 1, Item 6). Discard seal (Figure 1, Item 5).
3. Remove two screws (Figure 1, Item 9), nuts (Figure 1, Item 10), coupling (Figure 1, Item 8), seal (Figure 1, Item 7), and pipe (Figure 1, Item 6) from semitrailer. Discard seal (Figure 1, Item 7).
4. Remove two screws (Figure 1, Item 11), nuts (Figure 1, Item 12), coupling (Figure 1, Item 15), seal (Figure 1, Item 14), and pipe (Figure 1, Item 6) from manifold assembly (Figure 1, Item 13). Discard seal (Figure 1, Item 14).

END OF TASK

INSTALLATION

1. Install pipe (Figure 1, Item 6) on manifold assembly (Figure 1, Item 13) with two screws (Figure 1, Item 11), nuts (Figure 1, Item 12), new seal (Figure 1, Item 14), and coupling (Figure 1, Item 15).
2. Install pipe (Figure 1, Item 6) on semitrailer with two screws (Figure 1, Item 9), nuts (Figure 1, Item 10), new seal (Figure 1, Item 7), and coupling (Figure 1, Item 8).
3. Install float piping (Figure 1, Item 1) on pipe (Figure 1, Item 6) with two screws (Figure 1, Item 3), nuts (Figure 1, Item 4), new seal (Figure 1, Item 5), and coupling (Figure 1, Item 2).
4. Install float piping (Figure 1, Item 1) on control valve assembly (Figure 1, Item 16) with two screws (Figure 1, Item 19), nuts (Figure 1, Item 18), new seal (Figure 1, Item 20), and coupling (Figure 1, Item 17).

INSTALLATION - Continued

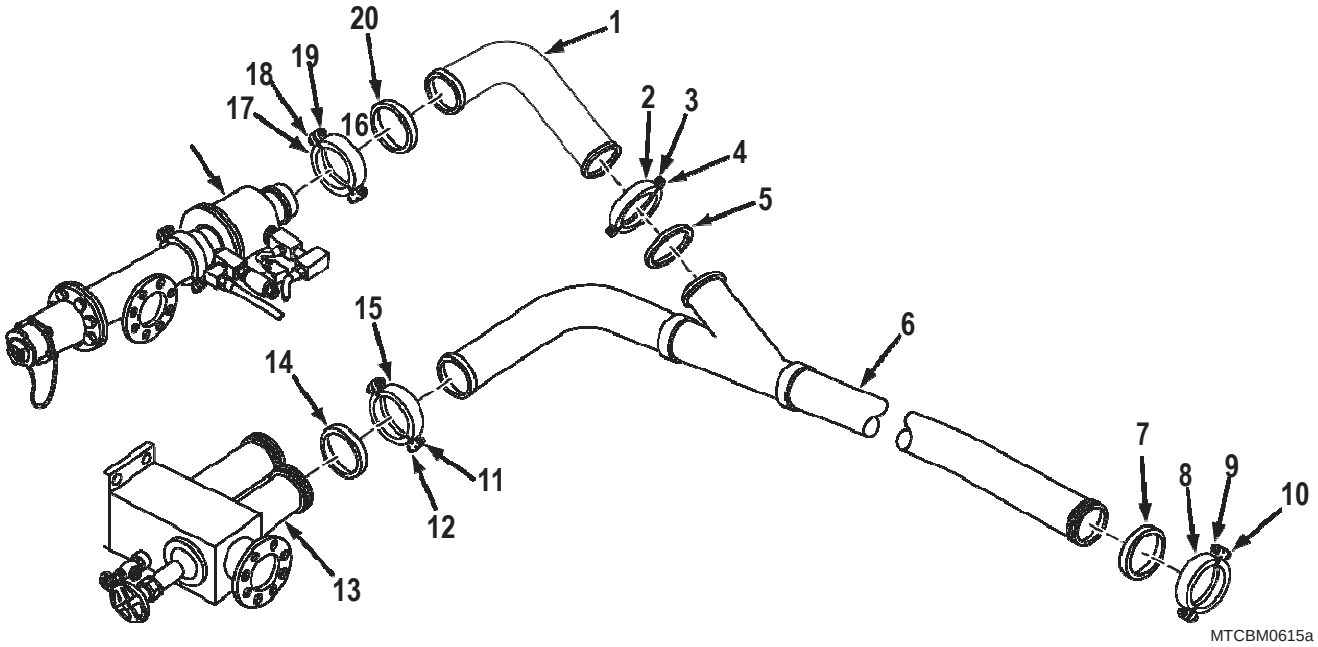

Figure 1. Emergency Valve and Float Piping Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
MANIFOLD AND FLANGE ASSEMBLY MAINTENANCE (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket Qty: (2) (WP 0295, Table 1, Item 21)
Nut, Self-Locking
Qty: (20) (WP 0295, Table 1, Item 166)
Petrolatum (WP 0293, Table 1, Item 19)
Seal, Nonmetallic
Qty: (2) (WP 0295, Table 1, Item 16)

Personnel Required
Two

References
WP 0003

Equipment Condition
Negative battery cable disconnected (WP 0098)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)
Tank drained and purged (WP 0012)

REMOVAL

CAUTION

Hose and tube ends should be covered after disconnection to prevent contaminants from entering fuel system. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Disconnect line (Figure 1, Item 3) from tee (Figure 1, Item 2) and disconnect line (Figure 1, Item 4) from tee (Figure 1, Item 1).

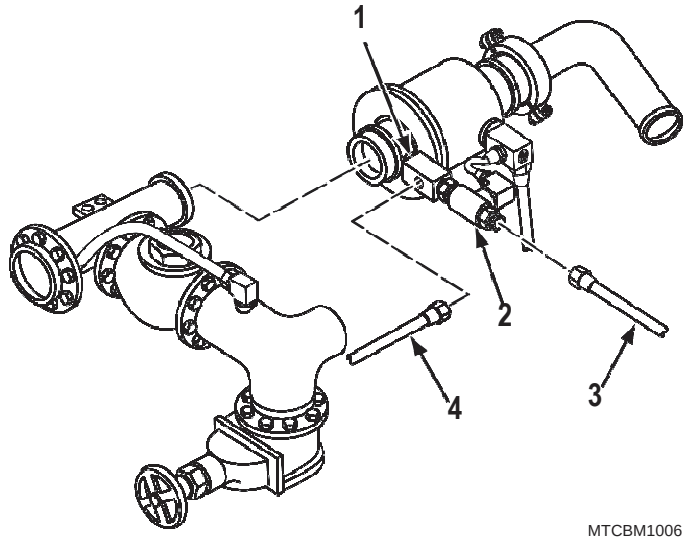

Figure 1. Flow Control Valve Lines Removal.

REMOVAL - Continued

2. Disconnect line (Figure 2, Item 4) from elbow (Figure 2, Item 11) and disconnect line (Figure 2, Item 10) from tee (Figure 2, Item 9).
3. Remove two nuts (Figure 2, Item 2), coupling (Figure 2, Item 13), and seal (Figure 2, Item 12) from flange assembly (Figure 2, Item 1) and flow control valve (Figure 2, Item 3). Discard seal (Figure 2, Item 12).
4. Remove two nuts (Figure 2, Item 6), coupling (Figure 2, Item 5), seal (Figure 2, Item 7), and flow control valve (Figure 2, Item 3) from piping (Figure 2, Item 8). Discard seal (Figure 2, Item 7).

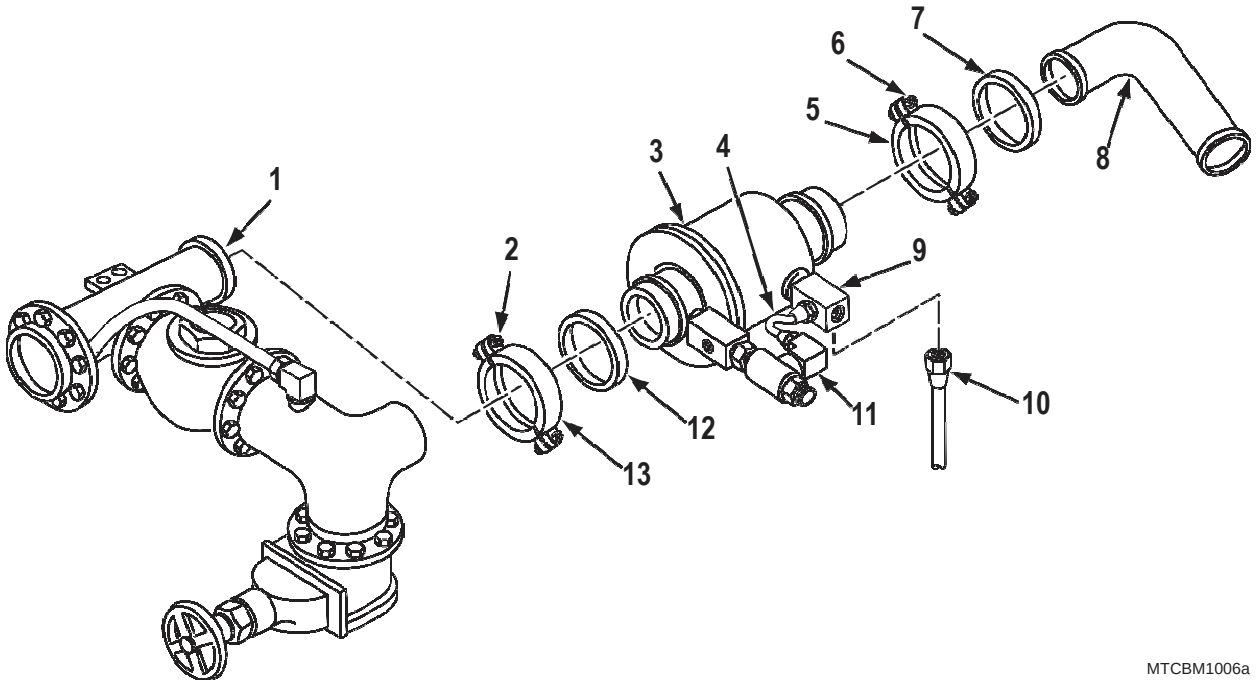

Figure 2. Flow Control Valve.

REMOVAL - Continued

5. Disconnect line (Figure 3, Item 7) from adapter (Figure 3, Item 6).
6. Remove elbow (Figure 3, Item 8), tee (Figure 3, Item 9), adapter (Figure 3, Item 10), tee (Figure 3, Item 11), and check valve (Figure 3, Item 12) from flow control valve (Figure 3, Item 1).
7. Remove adapter (Figure 3, Item 6) from tee (Figure 3, Item 3).
8. Remove adapter (Figure 3, Item 2), and tee (Figure 3, Item 3) from flow control valve (Figure 3, Item 1).
9. Remove elbow (Figure 3, Item 8) from tee (Figure 3, Item 9).

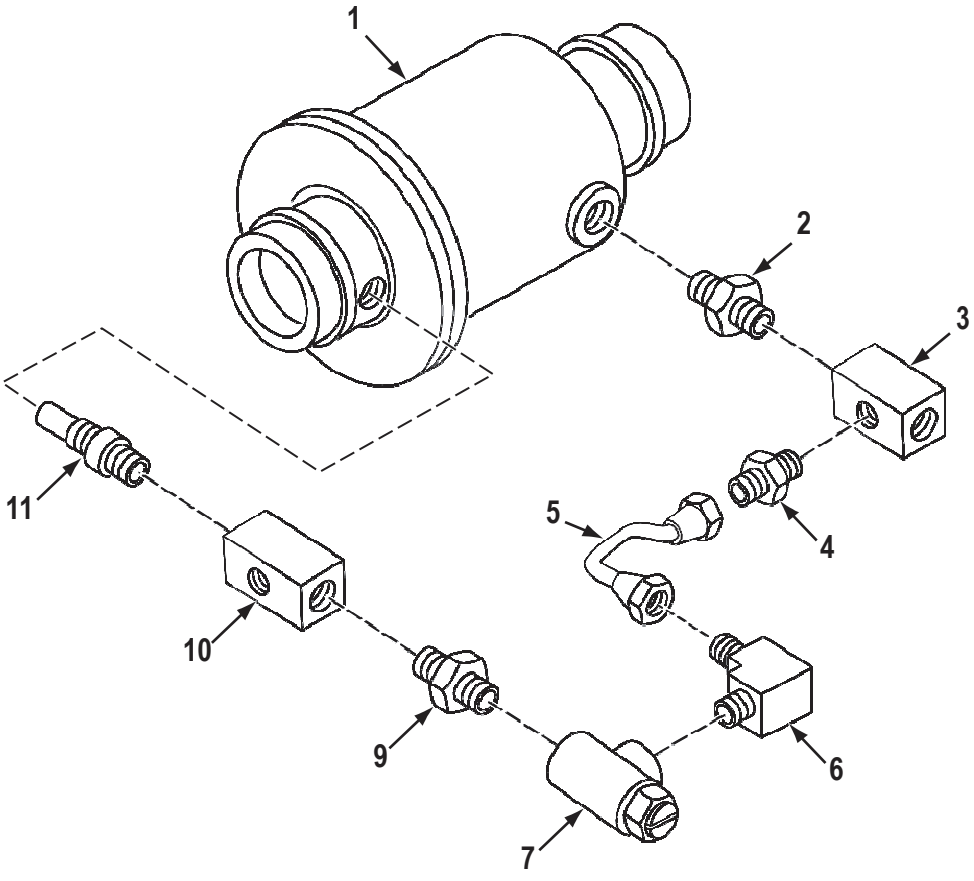

Figure 3. Flow Control Valve Removal.

REMOVAL - Continued

10. Remove cap (Figure 4, Item 18) from coupling (Figure 4, Item 17).
11. Remove eight screws (Figure 4, Item 1), 16 washers (Figure 4, Item 20), eight self-locking nuts (Figure 4, Item 19), coupling (Figure 4, Item 17), and gasket (Figure 4, Item 16) from flange assembly (Figure 4, Item 9). Discard self-locking nuts (Figure 4, Item 19) and gasket (Figure 4, Item 16).
12. Remove eight screws (Figure 4, Item 8), gasket (Figure 4, Item 10), washers (Figure 4, Item 11), and self-locking nuts (Figure 4, Item 12) from precheck valve (Figure 4, Item 13) and flange assembly (Figure 4, Item 9). Discard self-locking nuts (Figure 4, Item 12) and gasket (Figure 4, Item 10).
13. Remove two screws (Figure 4, Item 3), four washers (Figure 4, Items 2 and 14), two self-locking nuts (Figure 4, Item 15), and flange assembly (Figure 4, Item 9) from bracket (Figure 4, Item 5) and precheck valve (Figure 4, Item 13). Discard self-locking nuts (Figure 4, Item 15) and gasket (Figure 4, Item 10).
14. Remove two screws (Figure 4, Item 4), washers (Figure 4, Item 6), self-locking nuts (Figure 4, Item 7), and bracket (Figure 4, Item 5) from semitrailer. Discard self-locking nuts (Figure 4, Item 7).

END OF TASK

INSTALLATION

1. Install bracket (Figure 4, Item 5) on semitrailer with two screws (Figure 4, Item 4), washers (Figure 4, Item 6), and new self-locking nuts (Figure 4, Item 7).
2. Install flange assembly (Figure 4, Item 9) and new gasket (Figure 4, Item 10) on precheck valve (Figure 4, Item 13) with eight screws (Figure 4, Item 8), washers (Figure 4, Item 11), and new self-locking nuts (Figure 4, Item 12).

NOTE

Do not torque screws until after all connections are made.

3. Install flange assembly (Figure 4, Item 9) and precheck valve (Figure 4, Item 13) on bracket (Figure 4, Item 5) with two screws (Figure 4, Item 3), four washers (Figure 4, Items 2 and 14), and two new self-locking nuts (Figure 4, Item 15).
4. Install coupling (Figure 4, Item 17) and new gasket (Figure 4, Item 16) on flange assembly (Figure 4, Item 9) with eight screws (Figure 4, Item 1), 16 washers (Figure 4, Item 20), and eight new self-locking nuts (Figure 4, Item 19).
5. Install cap (Figure 4, Item 18) on coupling (Figure 4, Item 17).

INSTALLATION - Continued

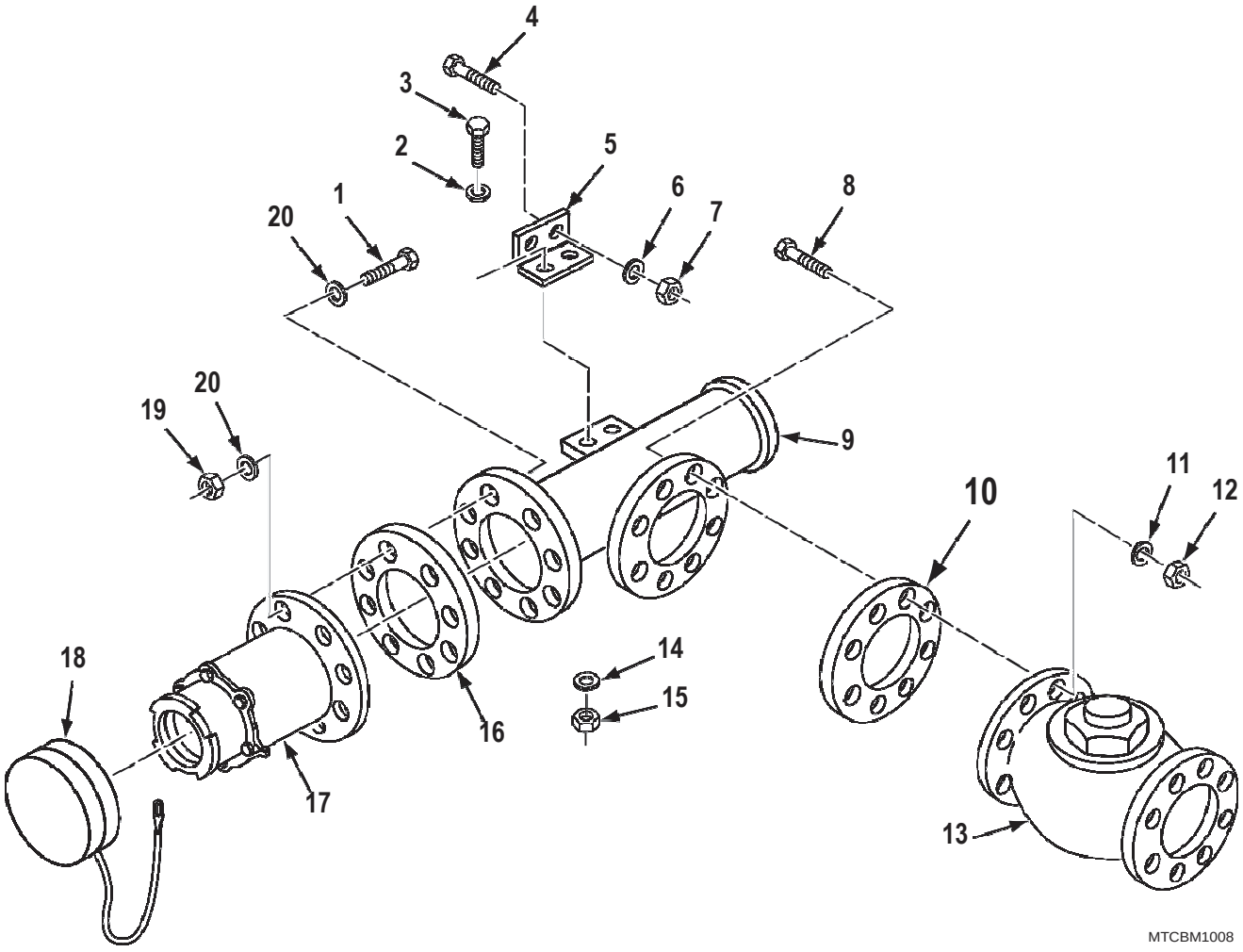

Figure 4. Flow Control Valve Replacement.

INSTALLATION - Continued

NOTE

To make connecting hoses easier, do not completely tighten fittings until after flow control valve has been installed.

6. Install elbow (Figure 5, Item 8) in tee (Figure 5, Item 9).
7. Install tee (Figure 5, Item 3) and adapter (Figure 5, Item 2) on flow control valve (Figure 5, Item 1).
8. Install adapter (Figure 5, Item 6) on tee (Figure 5, Item 3).
9. Install check valve (Figure 5, Item 12), tee (Figure 5, Item 11), adapter (Figure 5, Item 10), tee (Figure 5, Item 9), and elbow (Figure 5, Item 8) in flow control valve (Figure 5, Item 1).
10. Connect line (Figure 5, Item 7) to adapter (Figure 5, Item 6).

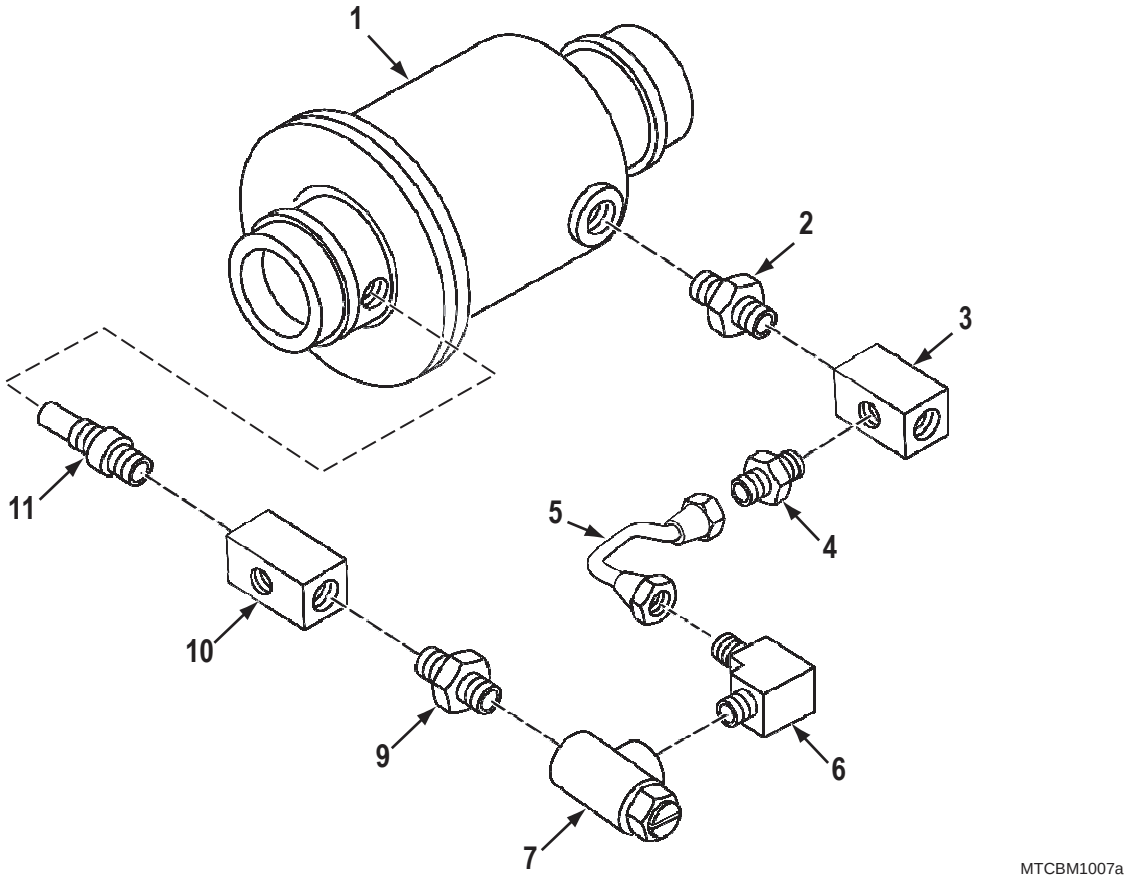

Figure 5. Flow Control Valve Installation.

INSTALLATION - Continued

NOTE

Lubricate seal with petrolatum prior to installation.

11. Install flow control valve (Figure 6, Item 7), new seal (Figure 6, Item 4), and coupling (Figure 6, Item 2) on flange assembly (Figure 6, Item 1) with two nuts (Figure 6, Item 3).
12. Install new seal (Figure 6, Item 10) and coupling (Figure 6, Item 8) on piping (Figure 6, Item 11) and flow control valve (Figure 6, Item 7) with two nuts (Figure 6, Item 9).
13. Connect line (Figure 6, Item 13) to tee (Figure 6, Item 12) and connect line (Figure 6, Item 6) to elbow (Figure 6, Item 14).
14. Connect line (Figure 6, Item 17) to tee (Figure 6, Item 5) and connect line (Figure 6, Item 16) to tee (Figure 6, Item 15).
15. Connect negative battery cable, refer to (WP 0098).

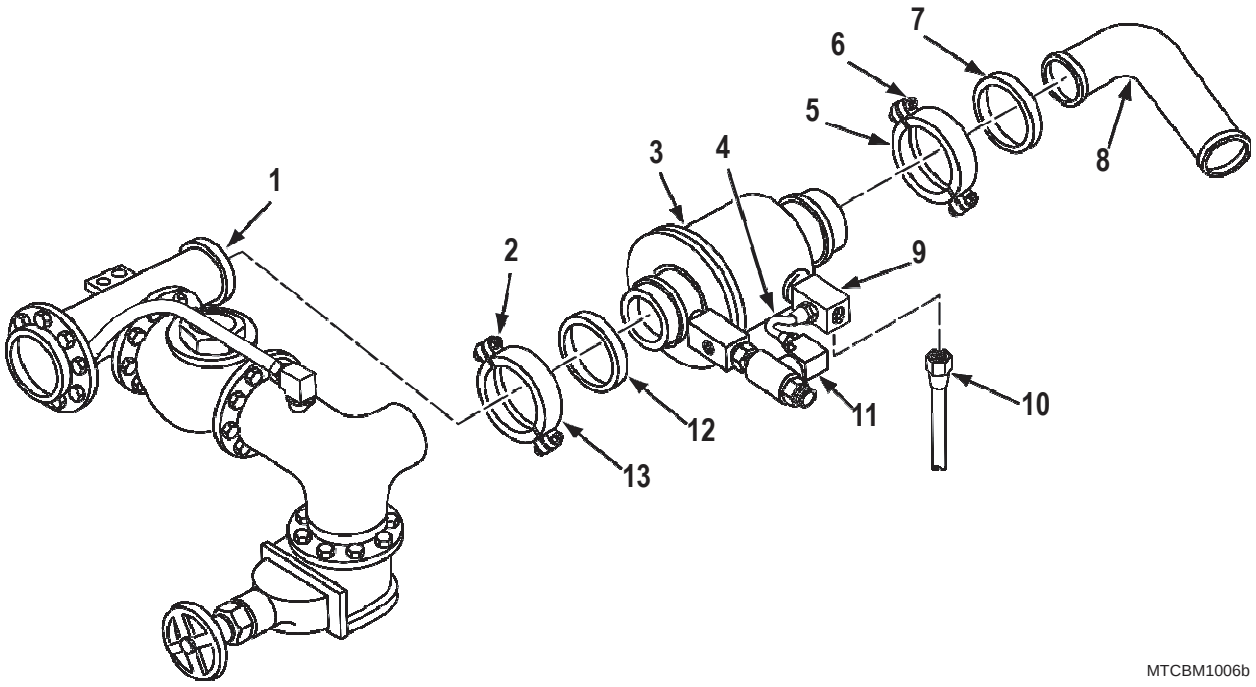

Figure 6. Flow Control Valve Lines Installation.

END OF TASK

ADJUSTMENT

WARNING

Make sure tank is empty before adjusting flow control valve. Failure to do so may result in damage to equipment or cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Install a 0-60 psi (0-413.7 kPa) pressure gage (Figure 7, Item 2) in 3/8 in. (2.67 cm) NPT port on underwing nozzle (Figure 7, Item 1) (filtered self-load or non-filtered bottom load).
2. Connect underwing nozzle (Figure 7, Item 1) (self-load) or storage facility hose to bottom load adapter.

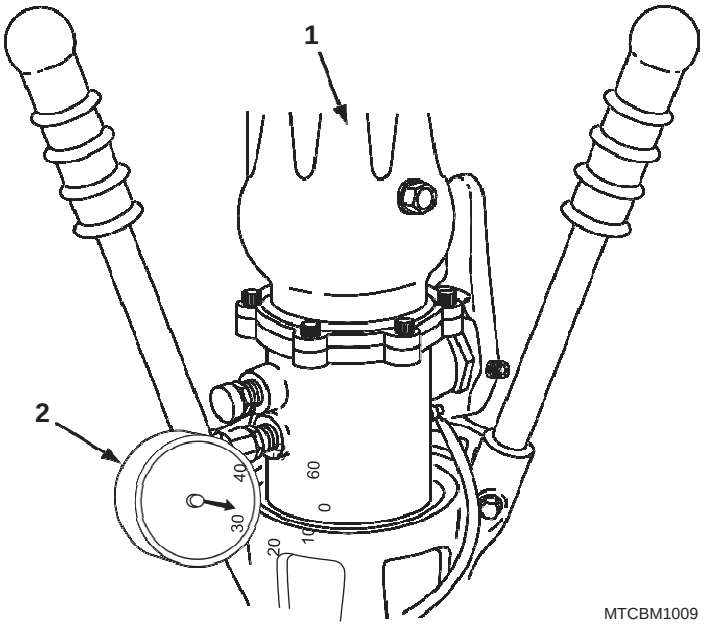

Figure 7. Flow Control Valve Pressure Gage.

3. Remove plastic plug (Figure 8, Item 3) from needle valve (Figure 8, Item 2).
4. Using a 4 in. (10.16 cm) long screwdriver, turn screwdriver counterclockwise 8-10 full turns to open needle valve (Figure 8, Item 2) on control valve (Figure 8, Item 1).
5. Start engine and begin loading, refer to (WP 0003).

ADJUSTMENT - Continued

WARNING

Make sure tank is empty before adjusting flow control valve. Failure to do so may result in damage to equipment or cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

6. Turn needle valve (Figure 8, Item 2) clockwise in 1/4-turn increments. Observe changes in pressure reading at each step, until there is no change in pressure. Open precheck valve D.
7. Sound of control valve (Figure 8, Item 1) starting to close should be heard in approximately 30 seconds. Full shut-off should be obtained in an additional 3-5 seconds.

NOTE

Full shut-off is indicated by the sound of liquid flow or whistle stopping.

8. If full shut-off is not obtained, turn needle valve (Figure 8, Item 2) counterclockwise in 1/4-turn increments until it does. Close precheck valve D to allow flow to resume.

NOTE

Closing needle valve increases closing time. Opening needle valve decreases closing time.

9. Repeat Steps 6, 7 and 8, changing needle valve (Figure 8, Item 2) setting in 1/4-turn increments until 3-5 second closing rate is obtained.
10. Shut off engine, refer to (WP 0003).
11. Install plastic plug (Figure 8, Item 3) in needle valve (Figure 8, Item 2).

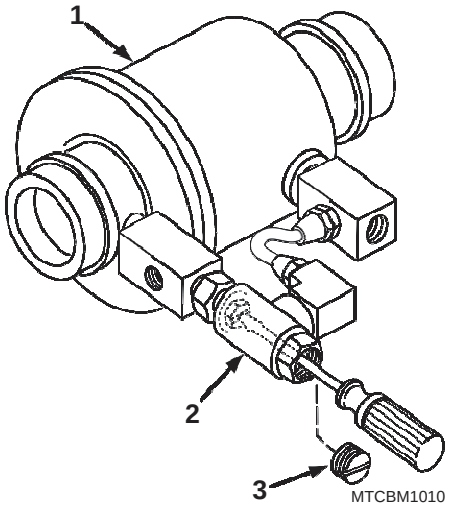

Figure 8. Flow Control Valve Adjustment.

ADJUSTMENT - Continued

12. Remove gage (Figure 9, Item 2) from underwing nozzle (Figure 7, Item 1) and stow nozzle (Figure 9, Item 1).

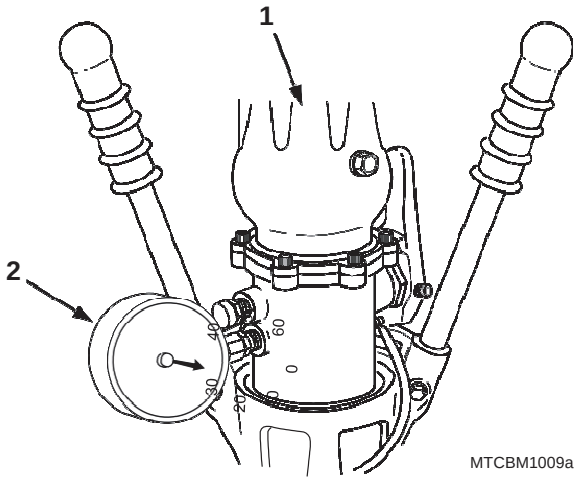

Figure 9. Flow Control Valve Pressure Gage Removal.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FLOW CONTROL VALVE AND FLANGE ASSEMBLY MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket Qty: (2) (WP 0295, Table 1, Item 21)
Nut, Self-Locking
Qty: (20) (WP 0295, Table 1, Item 166)
Petrolatum (WP 0293, Table 1, Item 19)
Seal, Nonmetallic
Qty: (2) (WP 0295, Table 1, Item 16)

Personnel Required
Two

References
WP 0003

Equipment Condition
Negative battery cable disconnected (WP 0098)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)
Tank drained and purged (WP 0012)

REMOVAL

CAUTION

Hose and tube ends should be covered after disconnection to prevent contaminants from entering fuel system. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Disconnect line (Figure 1, Item 3) from tee (Figure 1, Item 2) and disconnect line (Figure 1, Item 4) from tee (Figure 1, Item 1).

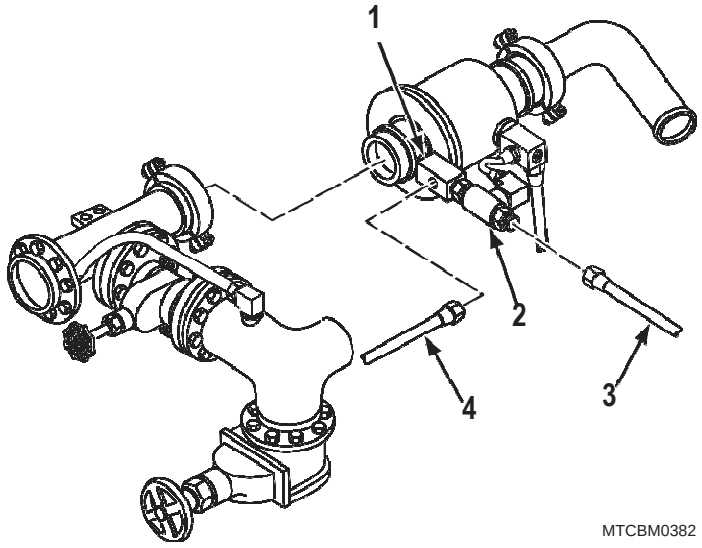

Figure 1. Flow Control Valve Lines Removal.

REMOVAL - Continued

2. Disconnect line (Figure 2, Item 4) from elbow (Figure 2, Item 11) and disconnect line (Figure 2, Item 10) from tee (Figure 2, Item 9).
3. Remove two nuts (Figure 2, Item 2), coupling (Figure 2, Item 13), and seal (Figure 2, Item 12) from flange assembly (Figure 2, Item 1) and flow control valve (Figure 2, Item 3). Discard seal (Figure 2, Item 12).
4. Remove two nuts (Figure 2, Item 6), coupling (Figure 2, Item 5), seal (Figure 2, Item 7), and flow control valve (Figure 2, Item 3) from piping (Figure 2, Item 8). Discard seal (Figure 2, Item 7).

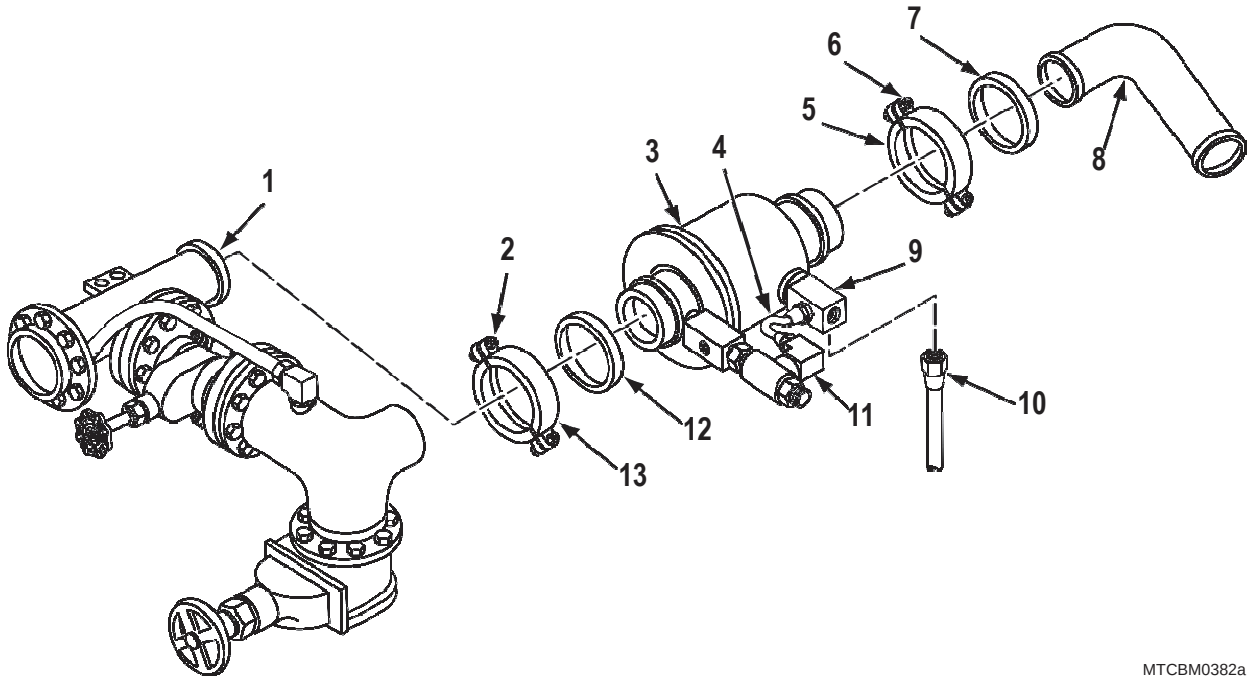

Figure 2. Flow Control Valve.

REMOVAL - Continued

5. Disconnect line (Figure 3, Item 7) from adapter (Figure 3, Item 6).
6. Remove elbow (Figure 3, Item 8), tee (Figure 3, Item 9), adapter (Figure 3, Item 10), tee (Figure 3, Item 11), and check valve (Figure 3, Item 12) from flow control valve (Figure 3, Item 1).
7. Remove adapter (Figure 3, Item 6) from tee (Figure 3, Item 3).
8. Remove adapter (Figure 3, Item 2), and tee (Figure 3, Item 3) from flow control valve (Figure 3, Item 1).
9. Remove elbow (Figure 3, Item 8) from tee (Figure 3, Item 9).

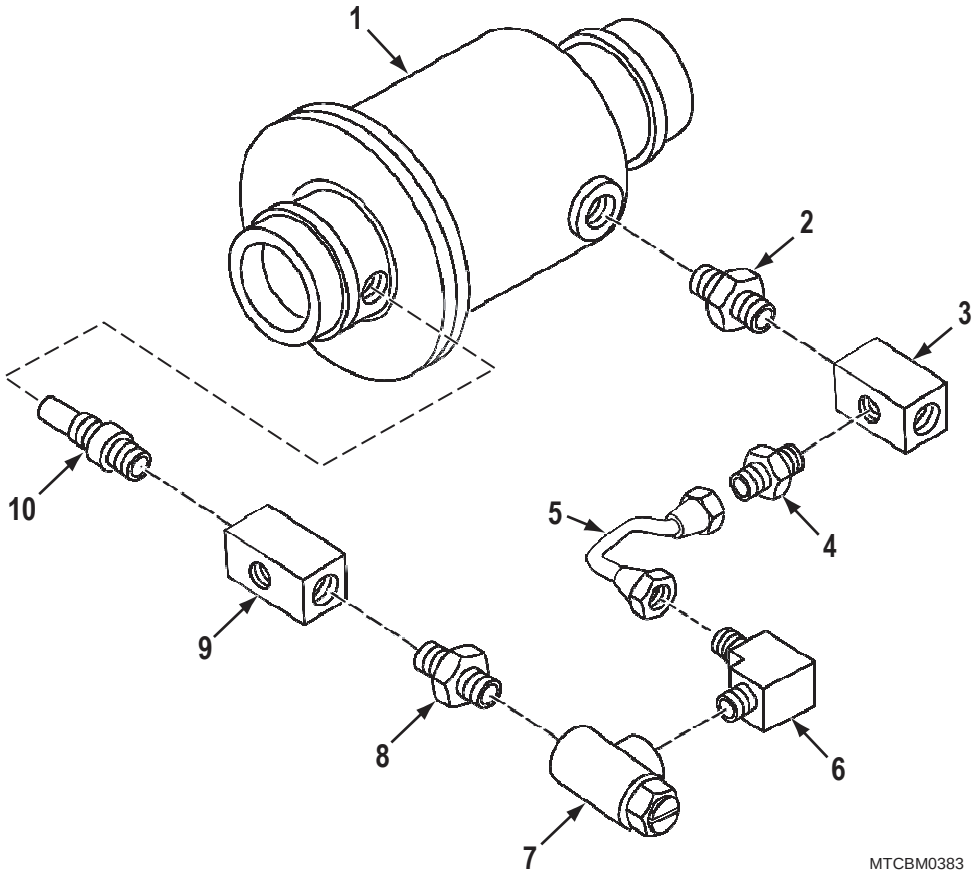

Figure 3. Flow Control Valve Removal.

REMOVAL - Continued

10. Remove cap (Figure 4, Item 18) from coupling (Figure 4, Item 17).
11. Remove eight screws (Figure 4, Item 1), 16 washers (Figure 4, Item 20), eight self-locking nuts (Figure 4, Item 19), coupling (Figure 4, Item 17), and gasket (Figure 4, Item 16) from flange assembly (Figure 4, Item 9). Discard self-locking nuts (Figure 4, Item 19) and gasket (Figure 4, Item 16).
12. Remove eight screws (Figure 4, Item 8), gasket (Figure 4, Item 10), washers (Figure 4, Item 11), and self-locking nuts (Figure 4, Item 12) from precheck valve (Figure 4, Item 13) and flange assembly (Figure 4, Item 9). Discard self-locking nuts (Figure 4, Item 12) and gasket (Figure 4, Item 10).
13. Remove two screws (Figure 4, Item 3), four washers (Figure 4, Items 2 and 14), two self-locking nuts (Figure 4, Item 15), and flange assembly (Figure 4, Item 9) from bracket (Figure 4, Item 5) and precheck valve (Figure 4, Item 13). Discard self-locking nuts (Figure 4, Item 15) and gasket (Figure 4, Item 10).
14. Remove two screws (Figure 4, Item 4), washers (Figure 4, Item 6), self-locking nuts (Figure 4, Item 7), and bracket (Figure 4, Item 5) from semitrailer. Discard self-locking nuts (Figure 4, Item 7).

END OF TASK

INSTALLATION

1. Install bracket (Figure 4, Item 5) on semitrailer with two screws (Figure 4, Item 4), washers (Figure 4, Item 6), and new self-locking nuts (Figure 4, Item 7).
2. Install flange assembly (Figure 4, Item 9) and new gasket (Figure 4, Item 10) on precheck valve (Figure 4, Item 13) with eight screws (Figure 4, Item 8), washers (Figure 4, Item 11), and new self-locking nuts (Figure 4, Item 12).

NOTE

Do not tighten screws until after all connections are made.

3. Install flange assembly (Figure 4, Item 9) and precheck valve (Figure 4, Item 13) on bracket (Figure 4, Item 5) with two screws (Figure 4, Item 3), four washers (Figure 4, Items 2 and 14), and two new self-locking nuts (Figure 4, Item 15).
4. Install coupling (Figure 4, Item 17) and new gasket (Figure 4, Item 16) on flange assembly (Figure 4, Item 9) with eight screws (Figure 4, Item 1), 16 washers (Figure 4, Item 20), and eight new self-locking nuts (Figure 4, Item 19).
5. Install cap (Figure 4, Item 18) on coupling (Figure 4, Item 17).

INSTALLATION - Continued

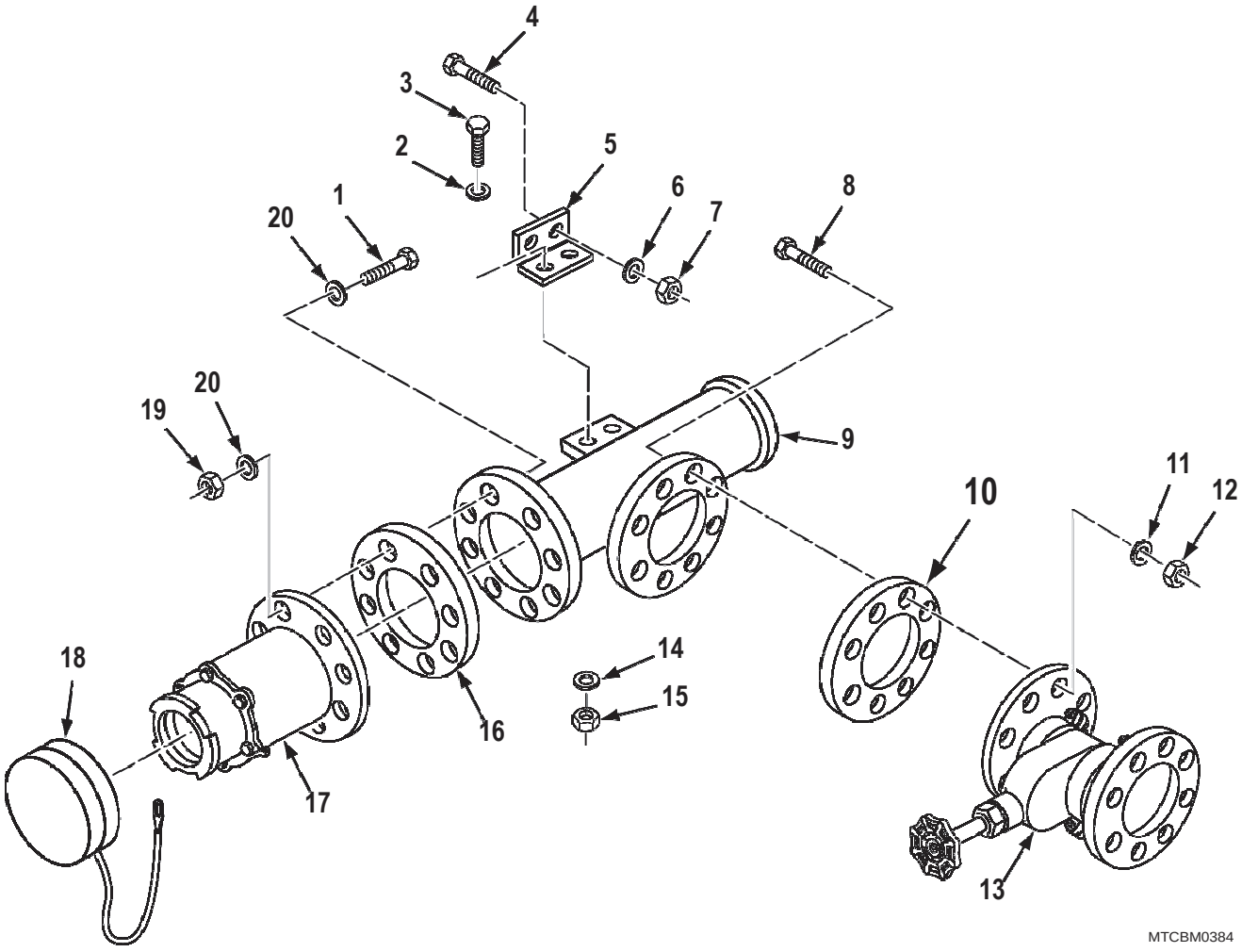

Figure 4. Flow Control Valve Replacement.

INSTALLATION - Continued

NOTE

To make connecting hoses easier, do not completely tighten fittings until after flow control valve has been installed.

6. Install elbow (Figure 5, Item 8) in tee (Figure 5, Item 9).
7. Install tee (Figure 5, Item 3) and adapter (Figure 5, Item 2) on flow control valve (Figure 5, Item 1).
8. Install adapter (Figure 5, Item 6) on tee (Figure 5, Item 3).
9. Install check valve (Figure 5, Item 12), tee (Figure 5, Item 11), adapter (Figure 5, Item 10), tee (Figure 5, Item 9), and elbow (Figure 5, Item 8) in flow control valve (Figure 5, Item 1).
10. Connect line (Figure 5, Item 7) to adapter (Figure 5, Item 6).

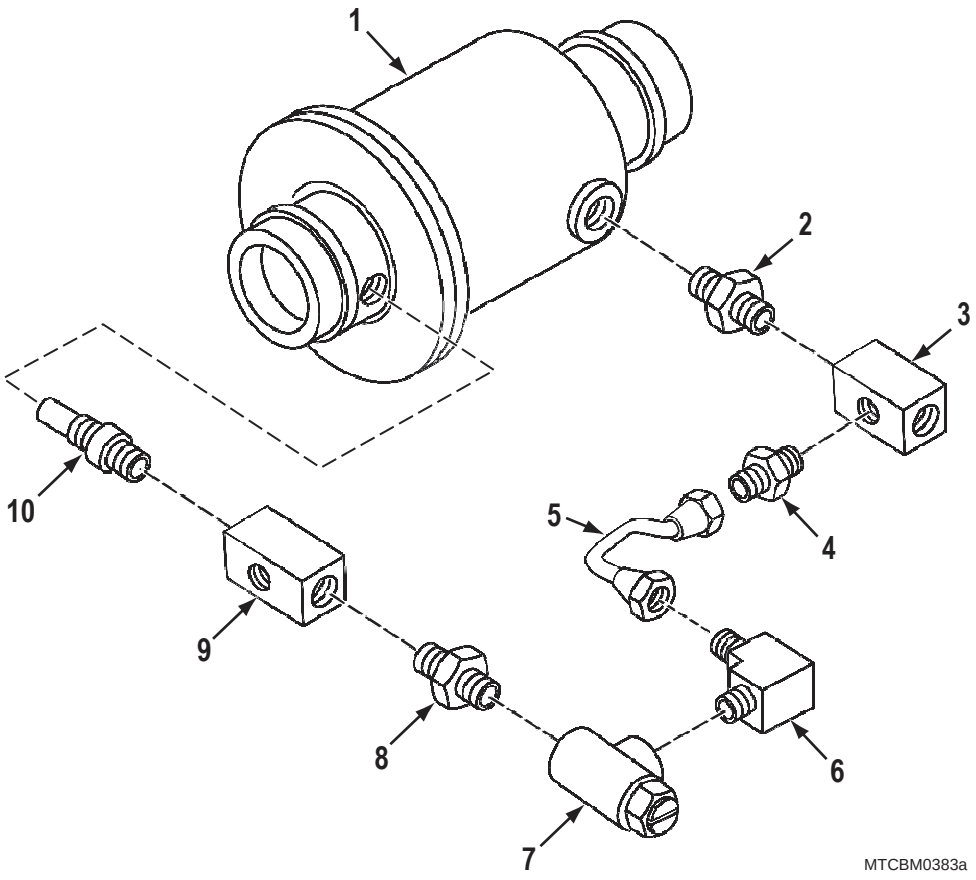

Figure 5. Flow Control Valve Installation.

INSTALLATION - Continued

NOTE

Lubricate seal with petrolatum prior to installation.

11. Install flow control valve (Figure 6, Item 7), new seal (Figure 6, Item 4), and coupling (Figure 6, Item 2) on flange assembly (Figure 6, Item 1) with two nuts (Figure 6, Item 3).
12. Install new seal (Figure 6, Item 10) and coupling (Figure 6, Item 8) on piping (Figure 6, Item 11) and flow control valve (Figure 6, Item 7) with two nuts (Figure 6, Item 9).
13. Connect line (Figure 6, Item 13) to tee (Figure 6, Item 12) and connect line (Figure 6, Item 6) to elbow (Figure 6, Item 14).
14. Connect line (Figure 6, Item 17) to tee (Figure 6, Item 5) and connect line (Figure 6, Item 16) to tee (Figure 6, Item 15).
15. Connect negative battery cable, refer to (WP 0098).

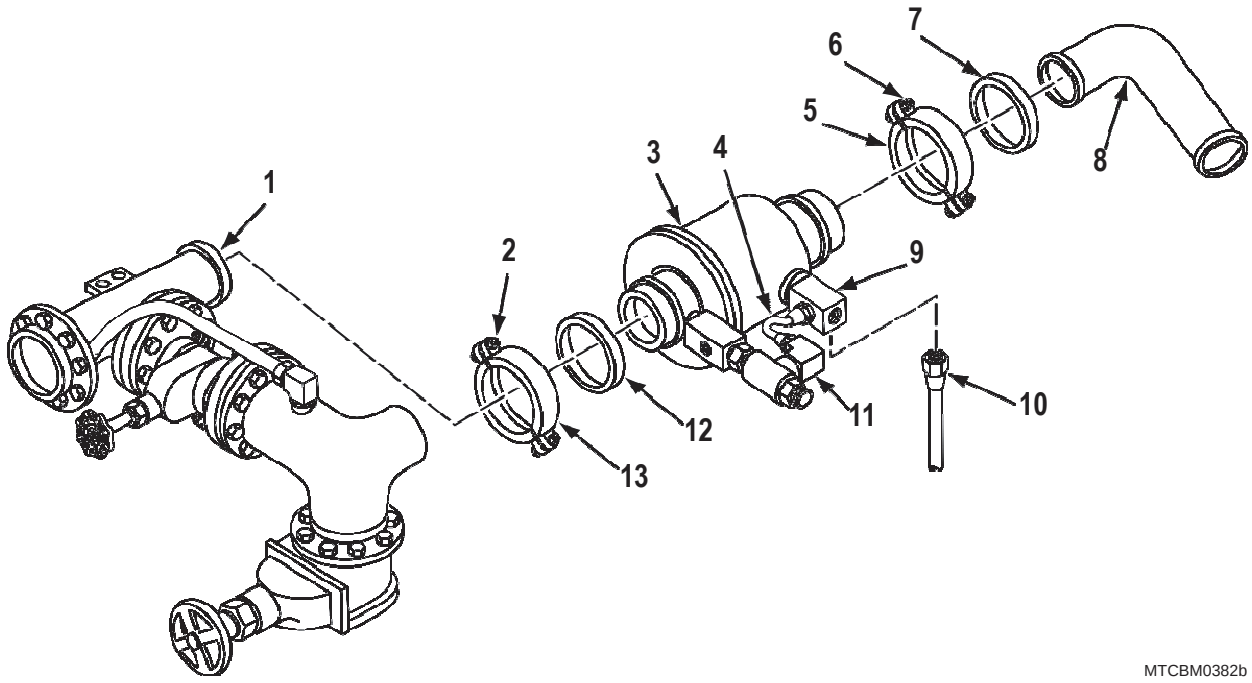

Figure 6. Flow Control Valve Lines Installation.

END OF TASK

ADJUSTMENT

WARNING

Make sure tank is empty before adjusting flow control valve. Failure to do so may result in damage to equipment or cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Install a 0-60 psi (0-413.7 kPa) pressure gage (Figure 7, Item 2) in 3/8 in. (2.67 cm) NPT port on underwing nozzle (Figure 7, Item 1) (filtered self-load or non-filtered bottom load).
2. Connect underwing nozzle (Figure 7, Item 1) (self-load) or storage facility hose to bottom load adapter.

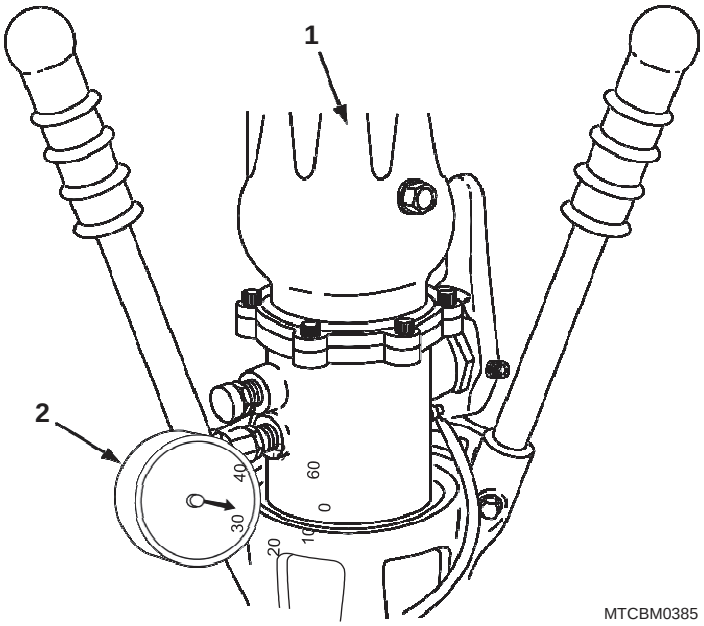

Figure 7. Flow Control Valve Pressure Gage.

3. Remove plastic plug (Figure 8, Item 3) from needle valve (Figure 8, Item 2).
4. Using a 4 in. (10.16 cm) long screwdriver, turn screwdriver counterclockwise 8-10 full turns to open needle valve (Figure 8, Item 2) on control valve (Figure 8, Item 1).
5. Start engine and begin loading, refer to (WP 0003).

ADJUSTMENT - Continued

WARNING

Make sure tank is empty before adjusting flow control valve. Failure to do so may result in damage to equipment or cause a spark to ignite. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

6. Turn needle valve (Figure 8, Item 2) clockwise in 1/4-turn increments. Observe changes in pressure reading at each step, until there is no change in pressure. Open precheck valve D.
7. Sound of control valve (Figure 8, Item 1) starting to close should be heard in approximately 30 seconds. Full shutoff should be obtained in an additional 3-5 seconds.

NOTE

Full shutoff is indicated by the sound of liquid flow or whistle stopping.

8. If full shutoff is not obtained, turn needle valve (Figure 8, Item 2) counterclockwise in 1/4-turn increments until it does. Close precheck valve D to allow flow to resume.

NOTE

Closing needle valve increases closing time. Opening needle valve decreases closing time.

9. Repeat Steps 6, 7 and 8, changing needle valve (Figure 8, Item 2) setting in 1/4-turn increments until 3-5 second closing rate is obtained.
10. Shut off engine, refer to (WP 0003).
11. Install plastic plug (Figure 8, Item 3) in needle valve (Figure 8, Item 2).

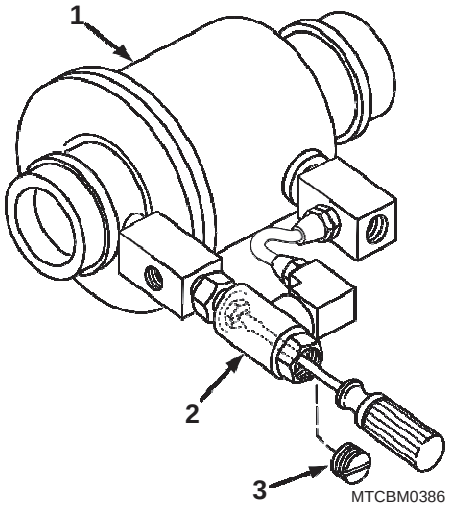

Figure 8. Flow Control Valve Adjustment.

ADJUSTMENT - Continued

12. Remove gage (Figure 9, Item 2) from underwing nozzle (Figure 7, Item 1) and stow nozzle (Figure 9, Item 1).

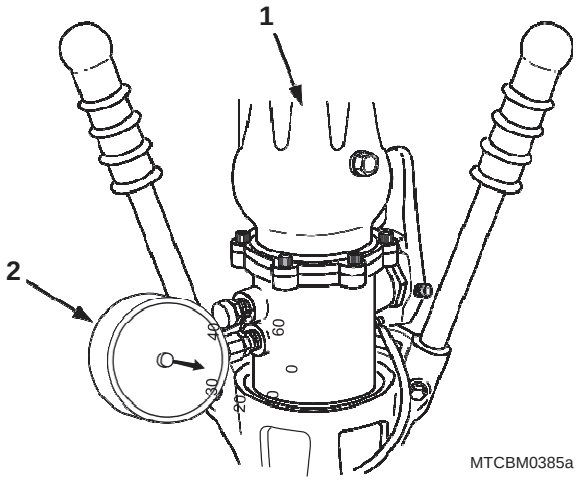

Figure 9. Flow Control Valve Pressure Gage Removal.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CONTROL VALVE ASSEMBLY MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0086
WP 0285

Materials/Parts
Coupling, Clamp, Pipe
(WP 0295, Table 1, Item 135)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Flow control valve assembly removed (WP 0247)

NOTE

Tag all hoses prior to removal for ease of installation.

DISASSEMBLY

1. Disconnect five hoses (Figure 1, Item 1) from control valve (Figure 1, Item 2).

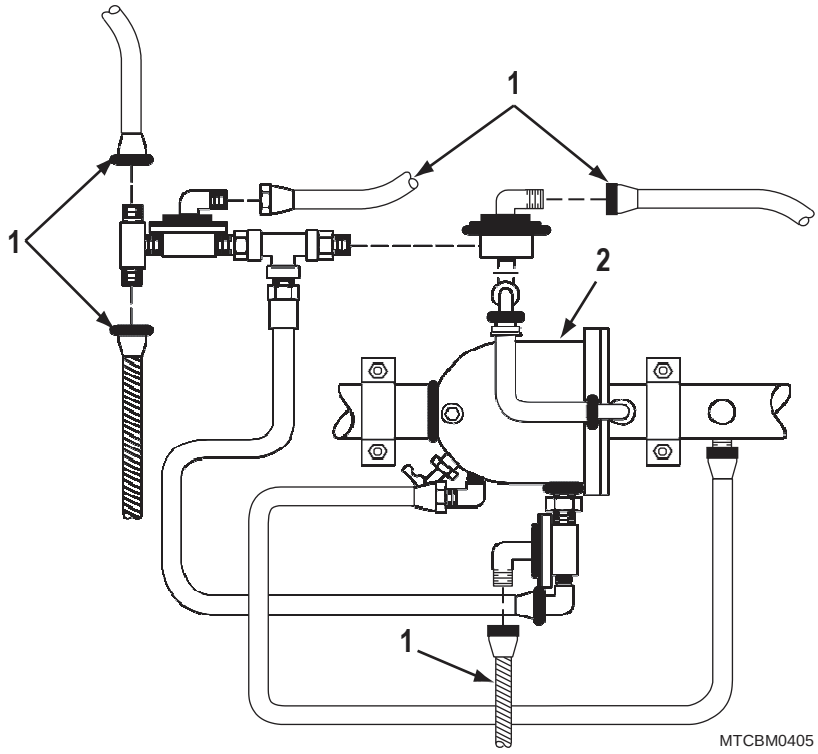

Figure 1. Control Valve Disassembly.

DISASSEMBLY - Continued

2. Loosen fitting (Figure 2, Item 9) and elbow (Figure 2, Item 16) and remove copper tubing (Figure 2, Item 10).
3. Remove two nuts (Figure 2, Item 20) and coupling (Figure 2, Item 19). Discard nuts and coupling (Figure 2, Items 19 and 20).
4. Remove two nuts (Figure 2, Item 6) and coupling (Figure 2, Item 7). Discard nuts and coupling (Figure 2, Items 6 and 7).
5. Slide coupling gaskets (Figure 2, Items 8 and 18) onto control valve (Figure 2, Item 5) and remove control valve.
6. Remove elbow (Figure 2, Item 4) from control valve (Figure 2, Item 5).
7. Remove coupling gaskets (Figure 2, Items 8 and 18). Discard gaskets (Figure 2, Items 8 and 18).
8. Loosen fittings (Figure 2, Items 13 and 21) and remove tube (Figure 2, Item 14).
9. Remove nipple (Figure 2, Item 11) and remove valve (Figure 2, Item 12) with elbows (Figure 2, Items 13 and 15).
10. Remove hose fitting (Figure 2, Items 21 and 24), tee (Figure 2, Item 25), nipple (Figure 2, Item 22), and valve (Figure 2, Item 23) with tee (Figure 2, Item 2).
11. Remove drain valve (Figure 2, Item 17) and elbow (Figure 2, Item 16).

END OF TASK

INSPECTION

Inspect hose ends for damage. Repair or replace if damaged (WP 0285).

END OF TASK

ASSEMBLY

1. Install elbow (Figure 2, Item 16) and drain valve (Figure 2, Item 17).
2. Install valve (Figure 2, Item 23) with tee (Figure 2, Item 2), nipple (Figure 2, Item 22), tee (Figure 2, Item 25), and hose fittings (Figure 2, Items 21 and 24). Install nipple (Figure 2, Item 3).
3. Install valve (Figure 2, Item 12) with elbows (Figure 2, Items 13 and 15) and nipple (Figure 2, Item 11).
4. Install tube (Figure 2, Item 14) and tighten fittings (Figure 2, Items 13 and 21).
5. Install new coupling gaskets (Figure 2, Items 8 and 18).
6. Install elbow (Figure 2, Item 4) on control valve (Figure 2, Item 5).
7. Install control valve (Figure 2, Item 5) and slide coupling gaskets (Figure 2, Items 8 and 18) into position.
8. Install new coupling (Figure 2, Item 7) and two new nuts (Figure 2, Item 6).
9. Install new coupling (Figure 2, Item 19) and two new nuts (Figure 2, Item 20).
10. Install copper tubing (Figure 2, Item 10) and tighten fitting (Figure 2, Item 9) and elbow (Figure 2, Item 16).
11. Connect and tag five nylon tubes (Figure 2, Item 1) onto control valve (Figure 2, Item 5).

ASSEMBLY - Continued

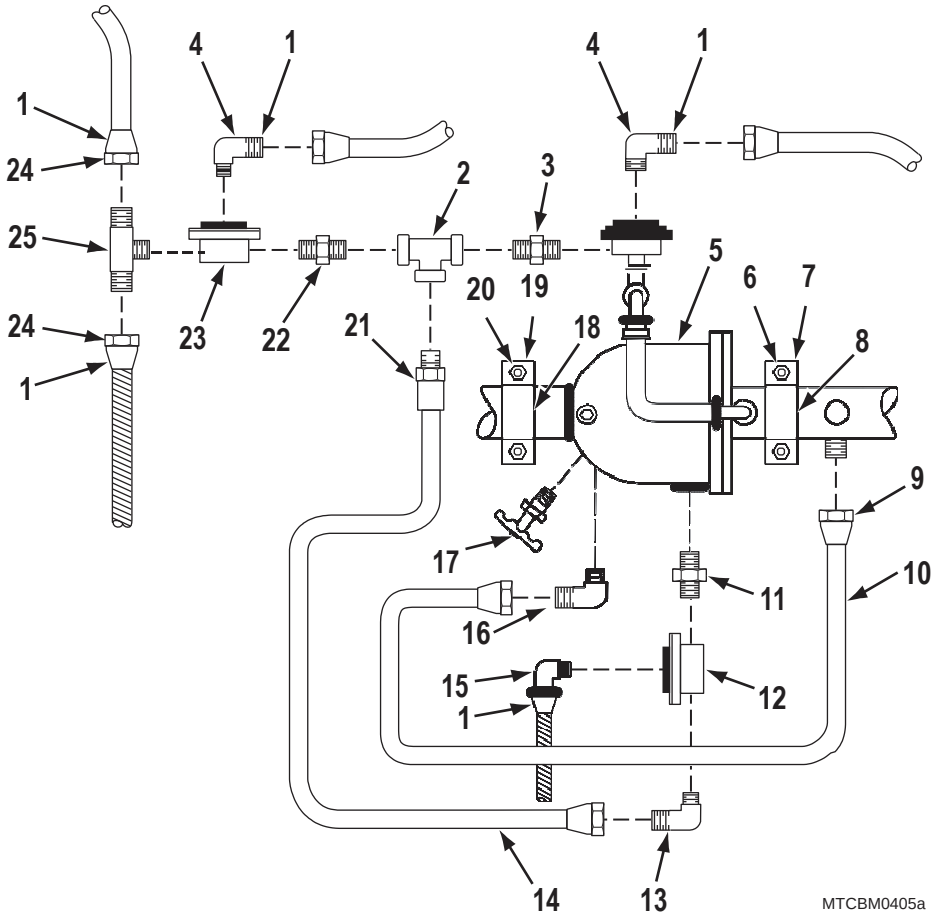

Figure 2. Control Valve Assembly.

END OF TASK

ADJUSTMENT

1. Remove plastic plug (Figure 3, Item 4) from needle valve (Figure 3, Item 3), located above 3 in. control valve (Figure 3, Item 1).
2. Using 4 in. long screwdriver (Figure 3, Item 5), close needle valve (Figure 3, Item 3) completely by turning adjusting screw (Figure 3, Item 2) clockwise.
3. When closed, turn adjusting screw (Figure 3, Item 2) five turns counterclockwise to adjust valve to proper setting.

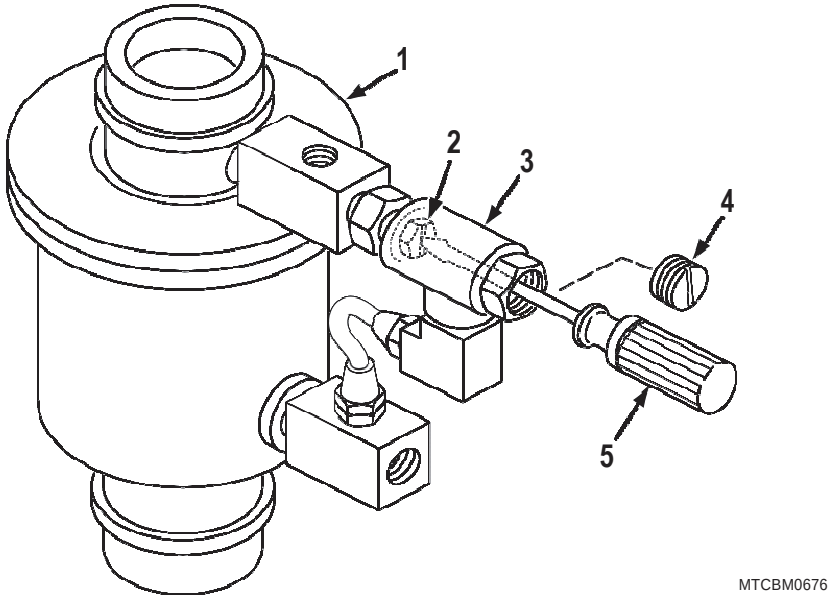

Figure 3. Control Valve Assembly Adjustment.

END OF TASK

FOLLOW ON TASK

1. Install flow control valve assembly (WP 0247).
2. Perform leak test (WP 0086).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
MANIFOLD VALVE ASSEMBLY MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 47)
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (18) (WP 0295, Table 1, Item 164)
Seal Qty: (2) (WP 0295, Table 1, Item 16)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Drain piping (WP 0012)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove two screws (Figure 1, Item 2), coupling (Figure 1, Item 1), seal (Figure 1, Item 3), and tubing (Figure 1, Item 4) from manifold valve assembly (Figure 1, Item 15). Discard seal (Figure 1, Item 3).
2. Remove two screws (Figure 1, Item 7), coupling (Figure 1, Item 6), seal (Figure 1, Item 8), and tubing (Figure 1, Item 5) from manifold valve assembly (Figure 1, Item 15). Discard seal (Figure 1, Item 8).
3. Remove eight self-locking nuts (Figure 1, Item 14), washers (Figure 1, Item 13), studs (Figure 1, Item 9), washers (Figure 1, Item 10), and self-locking nuts (Figure 1, Item 11) from manifold valve assembly (Figure 1, Item 15) and valve G (Figure 1, Item 12). Discard self-locking nuts (Figure 1, Items 11 and 14).
4. Remove two screws (Figure 1, Item 16), washers (Figure 1, Item 18), and self-locking nuts (Figure 1, Item 19) and manifold valve assembly (Figure 1, Item 15) from piping control cabinet (Figure 1, Item 17). Discard self-locking nuts (Figure 1, Item 19).

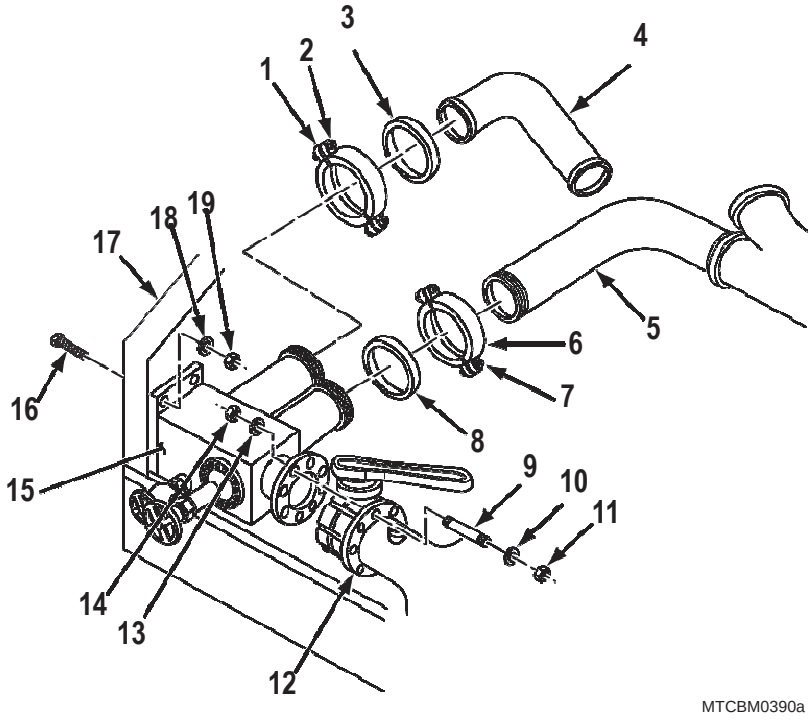

Figure 1. Manifold Valve Replacement.

END OF TASK

DISASSEMBLY

1. Remove 16 screws (Figure 2, Item 5), nuts (Figure 2, Item 3), valve (Figure 2, Item 6), and gasket (Figure 2, Item 4) from manifold valve assembly (Figure 2, Item 2). Discard gasket (Figure 2, Item 4).
2. Remove globe valve (Figure 2, Item 7) from nipple (Figure 2, Item 1) on manifold valve assembly (Figure 2, Item 2).

DISASSEMBLY - Continued

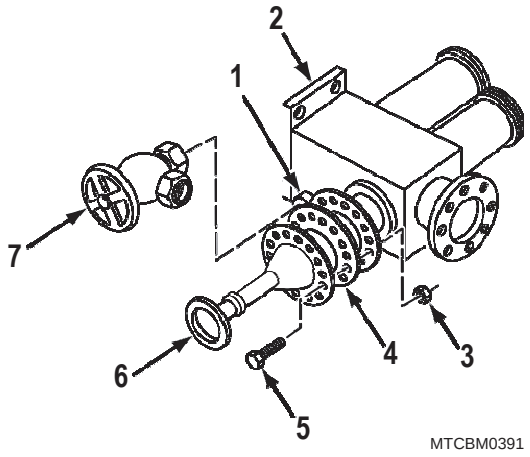

Figure 2. Manifold Valve Assembly and Disassembly.

END OF TASK

ASSEMBLY

1. Install globe valve (Figure 2, Item 7) on nipple (Figure 2, Item 1) in manifold valve assembly (Figure 2, Item 2).
2. Install valve (Figure 2, Item 6) and new gasket (Figure 2, Item 4) on manifold valve assembly (Figure 2, Item 2) with 16 screws (Figure 2, Item 5) and nuts (Figure 2, Item 3).

END OF TASK

INSTALLATION

NOTE

Do not tighten nuts until all connections are made.

1. Install manifold valve assembly (Figure 1, Item 15) in piping control cabinet (Figure 1, Item 17) with two screws (Figure 1, Item 16), washers (Figure 1, Item 18), and new self-locking nuts (Figure 1, Item 19).
2. Secure manifold valve assembly (Figure 1, Item 15) to valve G (Figure 1, Item 12) with eight new self-locking nuts (Figure 1, Item 11), washers (Figure 1, Item 10), studs (Figure 1, Item 9), new self-locking nuts (Figure 1, Item 14), and washers (Figure 1, Item 13).
3. Install tubing (Figure 1, Item 5) and new seal (Figure 1, Item 8) on manifold valve assembly (Figure 1, Item 15) with coupling (Figure 1, Item 6) and two screws (Figure 1, Item 7).
4. Install tubing (Figure 1, Item 4) and new seal (Figure 1, Item 3) on manifold valve assembly (Figure 1, Item 15) with coupling (Figure 1, Item 1) and two screws (Figure 1, Item 2).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
MANIFOLD DRAIN VALVE MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Packing, Preformed
(WP 0295, Table 1, Item 98)
Rag, Wiping

Materials/Parts (cont.)
(WP 0293, Table 1, Item 20)
Solvent, Cleaning Compound
(WP 0293, Table 1, Item 25)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

Turn manifold drain valve (Figure 1, Item 3) counterclockwise and remove manifold drain valve (Figure 1, Item 3) and pipe nipple (Figure 1, Item 2) from manifold (Figure 1, Item 1).

END OF TASK

DISASSEMBLY

Loosen packing nut (Figure 1, Item 12) and turn hand wheel (Figure 1, Item 11) counterclockwise. Remove nut (Figure 1, Item 12), hand wheel (Figure 1, Item 11), nut (Figure 1, Item 10), nipple (Figure 1, Item 9), sleeve (Figure 1, Item 8), insert (Figure 1, Item 7), stem (Figure 1, Item 6), packing (Figure 1, Item 5), and seat (Figure 1, Item 4) from manifold drain valve (Figure 1, Item 3). Discard packing (Figure 1, Item 5).

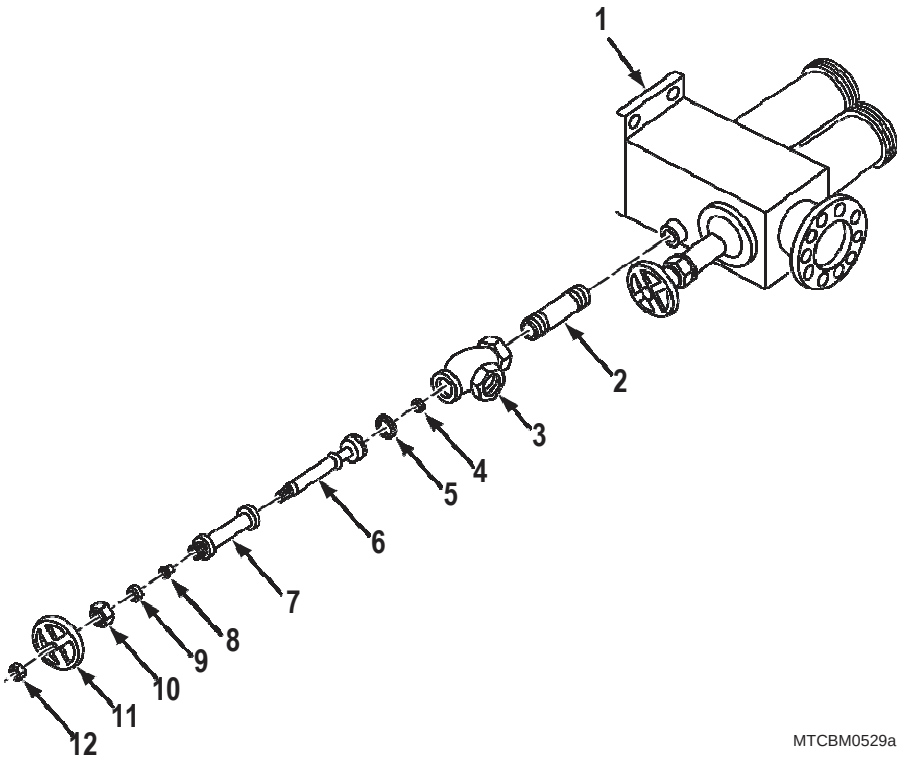

Figure 1. Manifold Drain Valve Removal and Disassembly.

END OF TASK

CLEANING AND INSPECTION

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Clean all metal parts with solvent and clean dry rags.
2. Inspect metal parts for cracks, scoring and pitting. Replace any damaged parts.

END OF TASK

ASSEMBLY

1. Install seat (Figure 2, Item 4), new packing (Figure 2, Item 5), stem (Figure 2, Item 6), insert (Figure 2, Item 7), sleeve (Figure 2, Item 8), nipple (Figure 2, Item 9), nut (Figure 2, Item 10), hand wheel (Figure 2, Item 11), and packing nut (Figure 2, Item 12) in manifold drain valve (Figure 2, Item 3).
2. Tighten packing nut (Figure 2, Item 12) and turn hand wheel (Figure 2, Item 11) clockwise.

END OF TASK

INSTALLATION

Install pipe nipple (Figure 2, Item 2) and manifold drain valve (Figure 2, Item 3) on manifold (Figure 2, Item 1). Turn manifold drain valve (Figure 2, Item 3) clockwise to tighten.

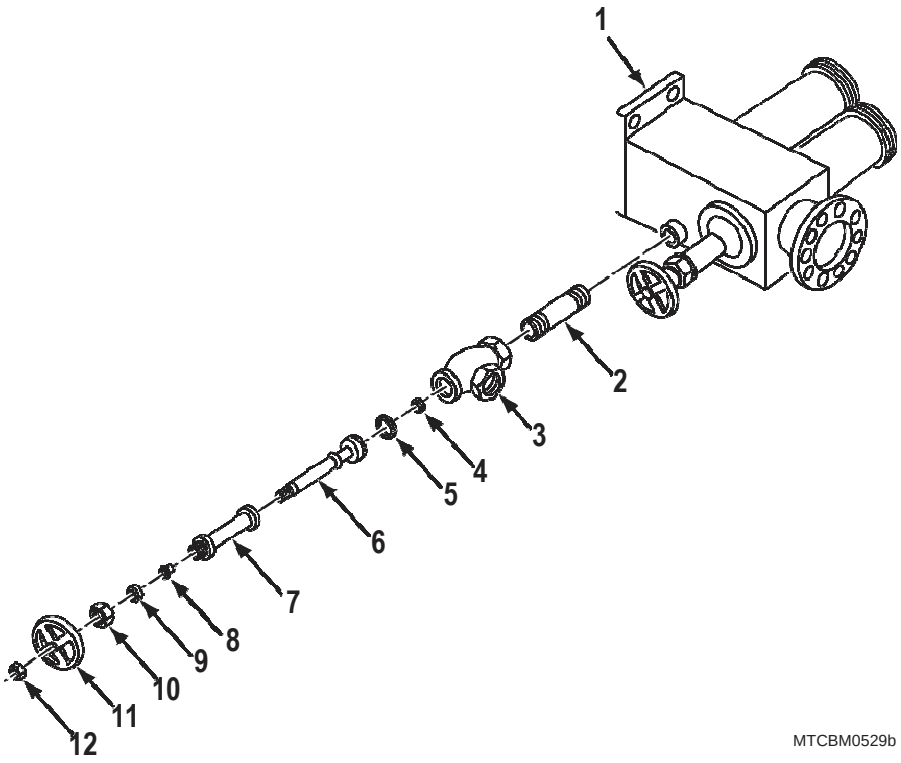

Figure 2. Manifold Drain Valve Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CENTRIFUGAL PUMP TUBING ASSEMBLY REPLACEMENT (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Filter, Element, Fluid
(WP 0295, Table 1, Item 24)
Gasket Qty: (2) (WP 0295, Table 1, Item 23)
Nut, Self-Locking
Qty: (16) (WP 0295, Table 1, Item 159)

Materials/Parts (cont.)
Seal, Nonmetallic (WP 0295, Table 1, Item 11)
Seal, Nonmetallic
Qty: (6) (WP 0295, Table 1, Item 16)

Equipment Condition
Batteries removed (WP 0097)
Muffler and exhaust pipe removed (WP 0213)
Semitrailer uncoupled (WP 0007)
Tank drained and purged (WP 0012)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Remove two screws (Figure 1, Item 9), coupling (Figure 1, Item 11), seal (Figure 1, Item 12, and tubing (Figure 1, Item 13) from manifold valve assembly (Figure 1, Item 10). Discard seal (Figure 1, Item 12).
2. Remove two screws (Figure 1, Item 3), coupling (Figure 1, Item 2), seal (Figure 1, Item 1), and tubing (Figure 1, Item 13) from tubing (Figure 1, Item 4). Discard seal (Figure 1, Item 1).
3. Remove two screws (Figure 1, Item 6), coupling (Figure 1, Item 7), seal (Figure 1, Item 5), and tubing (Figure 1, Item 4) from manifold lube (Figure 1, Item 8). Discard seal (Figure 1, Item 5).

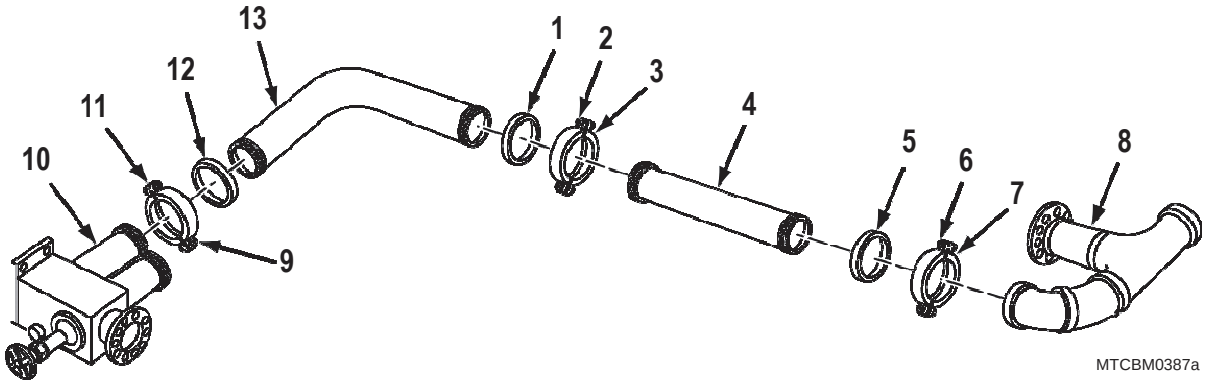

Figure 1. Centrifugal Pump Tubing Assembly Replacement.

4. Remove two screws (Figure 2, Item 22), coupling (Figure 2, Item 23), seal (Figure 2, Item 21), and tubing elbow (Figure 2, Item 1) from tubing (Figure 2, Item 20). Discard seal (Figure 2, Item 21).
5. Remove eight self-locking nuts (Figure 2, Item 2), gasket (Figure 2, Item 3), and tubing elbow (Figure 2, Item 1) from pump assembly (Figure 2, Item 4). Discard self-locking nuts (Figure 2, Item 2) and gasket (Figure 2, Item 3).
6. Remove two screws (Figure 2, Item 14), coupling (Figure 2, Item 13), dust plug (Figure 2, Item 12), and seal (Figure 2, Item 15) from tubing (Figure 2, Item 20). Discard seal (Figure 2, Item 15).
7. Remove two screws (Figure 2, Item 16), coupling (Figure 2, Item 17), seal (Figure 2, Item 18), and tubing (Figure 2, Item 20) from piping elbow (Figure 2, Item 19). Discard seal (Figure 2, Item 18).
8. Remove two screws (Figure 2, Item 7), coupling (Figure 2, Item 8), and seal (Figure 2, Item 9) from manifold tube (Figure 2, Item 11). Discard seal (Figure 2, Item 9).
9. Remove filter element (Figure 2, Item 10) from manifold tube (Figure 2, Item 11). Discard filter element (Figure 2, Item 10).
10. Remove eight self-locking nuts (Figure 2, Item 6), manifold tube (Figure 2, Item 11), and gasket (Figure 2, Item 5) from pump assembly (Figure 2, Item 4). Discard self-locking nuts (Figure 2, Item 6) and gasket (Figure 2, Item 5).

END OF TASK

INSTALLATION

1. Install new gasket (Figure 2, Item 5) and manifold tube (Figure 2, Item 11) on pump assembly (Figure 2, Item 4) with eight new self-locking nuts (Figure 2, Item 6).
2. Install new filter element (Figure 2, Item 10) in manifold tube (Figure 2, Item 11).

INSTALLATION - Continued

3. Install new seal (Figure 2, Item 9) in manifold tube (Figure 2, Item 11) with coupling (Figure 2, Item 8) and two screws (Figure 2, Item 7).
4. Install tubing (Figure 2, Item 20) and new seal (Figure 2, Item 18) on piping elbow (Figure 2, Item 19) with coupling (Figure 2, Item 17) and two screws (Figure 2, Item 16).
5. Install new seal (Figure 2, Item 15), dust plug (Figure 2, Item 12), and coupling (Figure 2, Item 13) on tubing (Figure 2, Item 20) with two screws (Figure 2, Item 14).
6. Install tubing elbow (Figure 2, Item 1) and new gasket (Figure 2, Item 3) on pump assembly (Figure 2, Item 4) with eight new self-locking nuts (Figure 2, Item 2).
7. Install tubing (Figure 2, Item 20) and new seal (Figure 2, Item 21) on tubing elbow (Figure 2, Item 1) with coupling (Figure 2, Item 23) and two screws (Figure 2, Item 22).
8. Install tubing (Figure 1, Item 4) and new seal (Figure 1, Item 5) on manifold tube (Figure 1, Item 8) with coupling (Figure 1, Item 6) and two screws (Figure 1, Item 7).
9. Install tubing (Figure 1, Item 13) on tubing (Figure 1, Item 4) with new seal (Figure 1, Item 1), coupling (Figure 1, Item 2), and two screws (Figure 1, Item 3).
10. Install tubing (Figure 1, Item 13) and new seal (Figure 1, Item 12) on manifold valve assembly (Figure 1, Item 10) with coupling (Figure 1, Item 11) and two screws (Figure 1, Item 9).

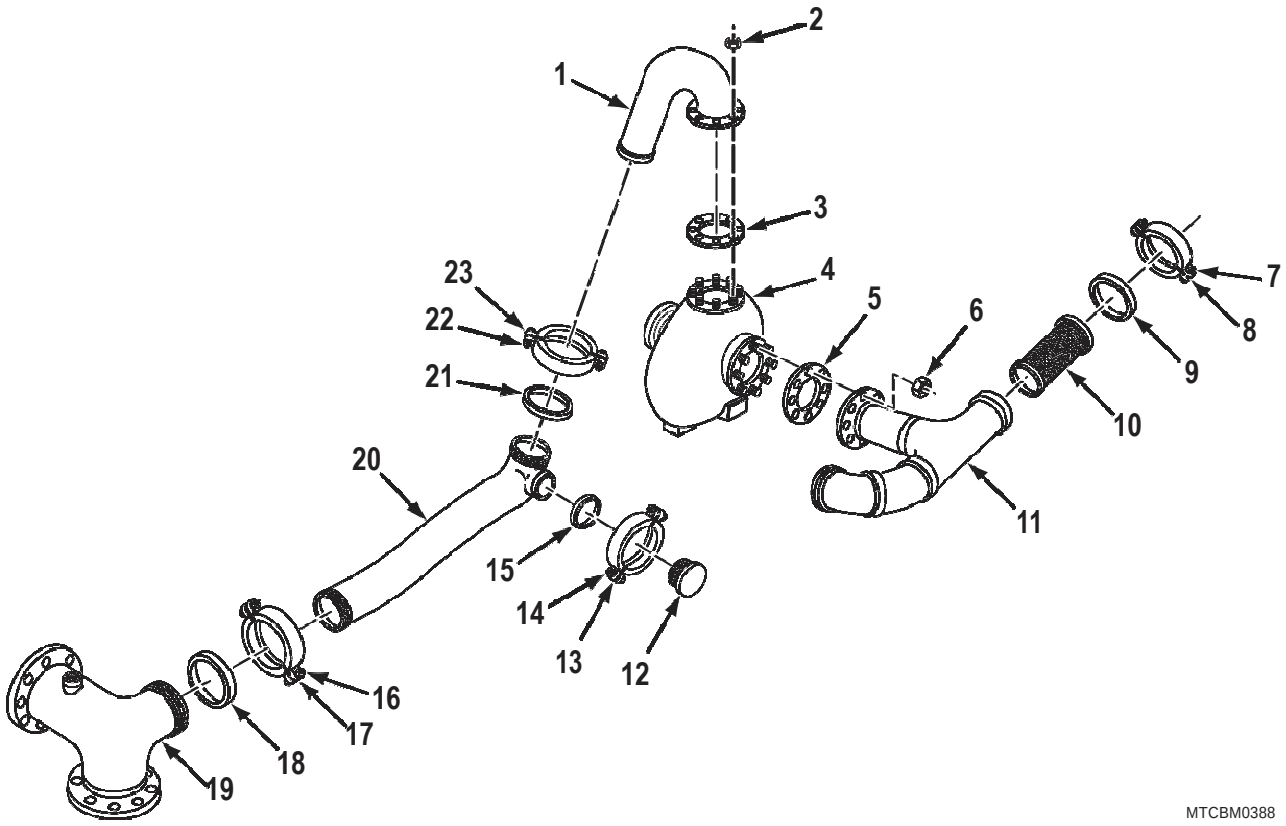

Figure 2. Centrifugal Pump Tubing Assembly Replacement.

END OF TASK

FOLLOW ON TASK

1. Install batteries (WP 0097).
2. Install muffler and exhaust pipe (WP 0213).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CENTRIFUGAL PUMP TUBING ASSEMBLY REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Filter, Element, Fluid
(WP 0295, Table 1, Item 24)
Gasket Qty: (2) (WP 0295, Table 1, Item 23)
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (16) (WP 0295, Table 1, Item 159)
Seal, Nonmetallic
Qty: (6) (WP 0295, Table 1, Item 16)

Equipment Condition
Batteries removed (WP 0097)
Muffler and exhaust pipe removed (WP 0213)
Semitrailer uncoupled (WP 0007)
Tank drained and purged (WP 0012)

WARNING

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CAUTION

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NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Remove two screws (Figure 1, Item 12), coupling (Figure 1, Item 17), seal (Figure 1, Item 11), and reducer pipe (Figure 1, Item 10) from valve (Figure 1, Item 9).
2. Remove valve (Figure 2, Item 17), reducer pipe (Figure 2, Item 18), seal (Figure 2, Item 19), and coupling (Figure 2, Item 20) from tubing (Figure 2, Item 12).
3. Remove two screws (Figure 1, Item 15), coupling (Figure 1, Item 14), seal (Figure 1, Item 16), and tubing (Figure 1, Item 17) from manifold valve assembly (Figure 1, Item 13). Discard seal (Figure 1, Item 16).
4. Remove two screws (Figure 1, Item 3), coupling (Figure 1, Item 2), seal (Figure 1, Item 1), and tubing (Figure 1, Item 17) from tubing (Figure 1, Item 4). Discard seal (Figure 1, Item 1).
5. Remove two screws (Figure 1, Item 6), coupling (Figure 1, Item 7), seal (Figure 1, Item 5), and tubing (Figure 1, Item 4) from manifold tube (Figure 1, Item 8). Discard seal (Figure 1, Item 5).

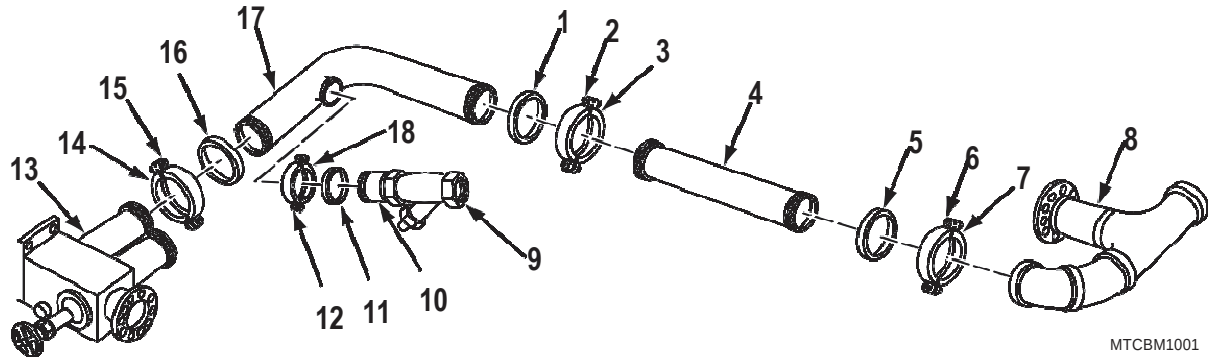

Figure 1. Centrifugal Pump Tubing Assembly Removal.

6. Remove two screws (Figure 2, Item 22), coupling (Figure 2, Item 23), seal (Figure 2, Item 21), and tubing elbow (Figure 2, Item 1) from tubing (Figure 2, Item 20). Discard seal (Figure 2, Item 21).
7. Remove eight self-locking nuts (Figure 2, Item 2), gasket (Figure 2, Item 3), and tubing elbow (Figure 2, Item 1) from pump assembly (Figure 2, Item 4). Discard self-locking nuts (Figure 2, Item 2) and gasket (Figure 2, Item 3).
8. Remove two screws (Figure 2, Item 16), coupling (Figure 2, Item 17), seal (Figure 2, Item 18), and tubing (Figure 2, Item 20) from piping elbow (Figure 2, Item 19). Discard seal (Figure 2, Item 18).
9. Remove two screws (Figure 2, Item 7), coupling (Figure 2, Item 8), and seal (Figure 2, Item 9) from manifold tube (Figure 2, Item 11). Discard seal (Figure 2, Item 9).
10. Remove filter element (Figure 2, Item 10) from manifold tube (Figure 2, Item 11). Discard filter element (Figure 2, Item 10).
11. Remove eight self-locking nuts (Figure 2, Item 6), manifold tube (Figure 2, Item 11), and gasket (Figure 2, Item 5) from pump assembly (Figure 2, Item 4). Discard self-locking nuts (Figure 2, Item 6) and gasket (Figure 2, Item 5).

END OF TASK

INSTALLATION

1. Install new gasket (Figure 2, Item 5) and manifold tube (Figure 2, Item 11) on pump assembly (Figure 2, Item 4) with eight new self-locking nuts (Figure 2, Item 6).
2. Install new filter element (Figure 2, Item 10) in manifold tube (Figure 2, Item 11).
3. Install new seal (Figure 2, Item 9) in manifold tube (Figure 2, Item 11) with coupling (Figure 2, Item 8) and two screws (Figure 2, Item 7).
4. Install tubing (Figure 2, Item 20) and new seal (Figure 2, Item 18) on piping elbow (Figure 2, Item 19) with coupling (Figure 2, Item 17) and two screws (Figure 2, Item 16).
5. Install tubing elbow (Figure 2, Item 1) and new gasket (Figure 2, Item 3) on pump assembly (Figure 2, Item 4) with eight new self-locking nuts (Figure 2, Item 2).
6. Install tubing (Figure 2, Item 20) and new seal (Figure 2, Item 21) on tubing elbow (Figure 2, Item 1) with coupling (Figure 2, Item 23) and two screws (Figure 2, Item 22).

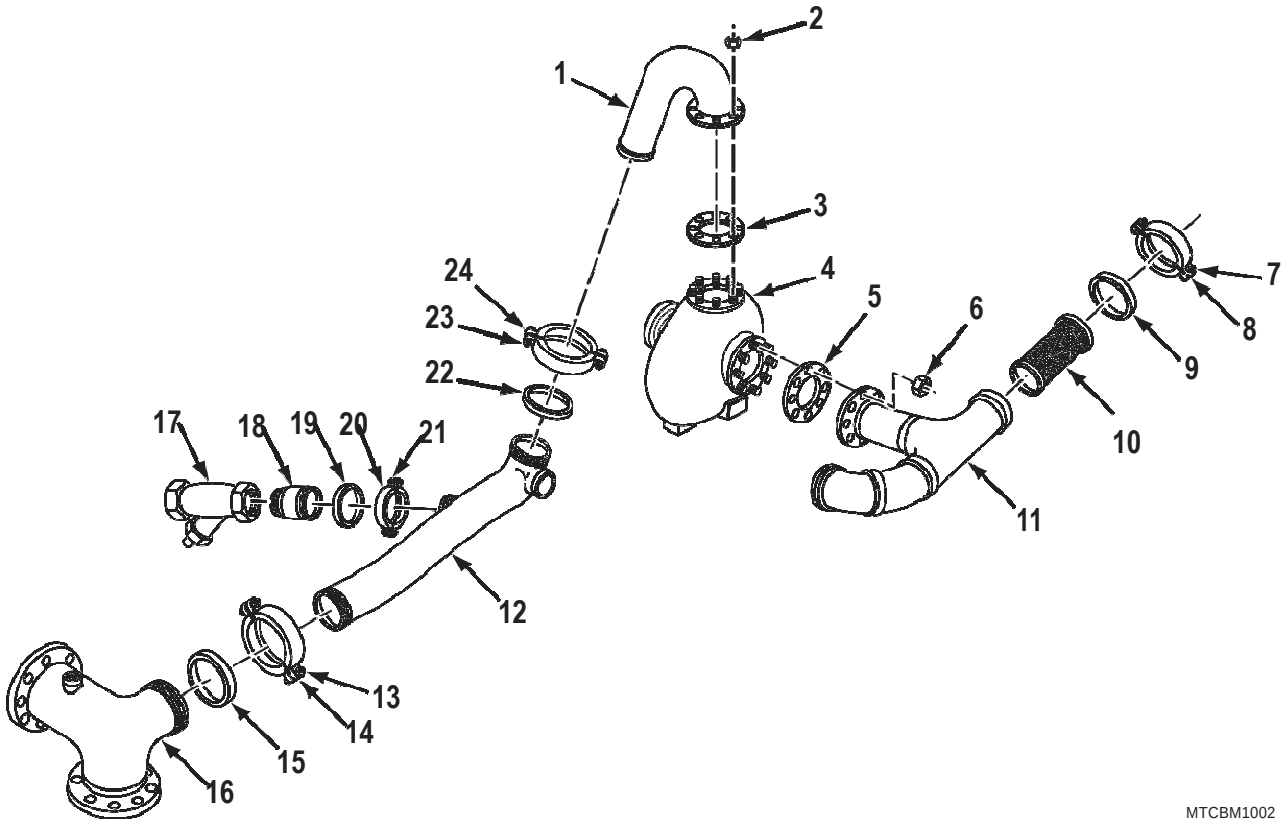

Figure 2. Centrifugal Pump Tubing Assembly Replacement.

INSTALLATION - Continued

7. Install tubing (Figure 3, Item 4) and new seal (Figure 3, Item 5) on manifold tube (Figure 3, Item 8) with coupling (Figure 3, Item 7) and two screws (Figure 3, Item 6).
8. Install tubing (Figure 3, Item 17) on tubing (Figure 3, Item 4) with new seal (Figure 3, Item 1), coupling (Figure 3, Item 2), and two screws (Figure 3, Item 3).
9. Install tubing (Figure 3, Item 17) and new seal (Figure 3, Item 16) on manifold valve assembly (Figure 3, Item 13) with coupling (Figure 3, Item 14) and two screws (Figure 3, Item 15).
10. Install coupling (Figure 2, Item 20) with two screws (Figure 2, Item 21), seal (Figure 2, Item 19), reducer pipe (Figure 2, Item 18), and valve (Figure 3, Item 17) on tubing (Figure 2, Item 12).
11. Install reducer pipe (Figure 3, Item 10), seal (Figure 3, Item 11), and coupling (Figure 3, Item 18) with two screws (Figure 3, Item 12) on valve (Figure 3, Item 9).

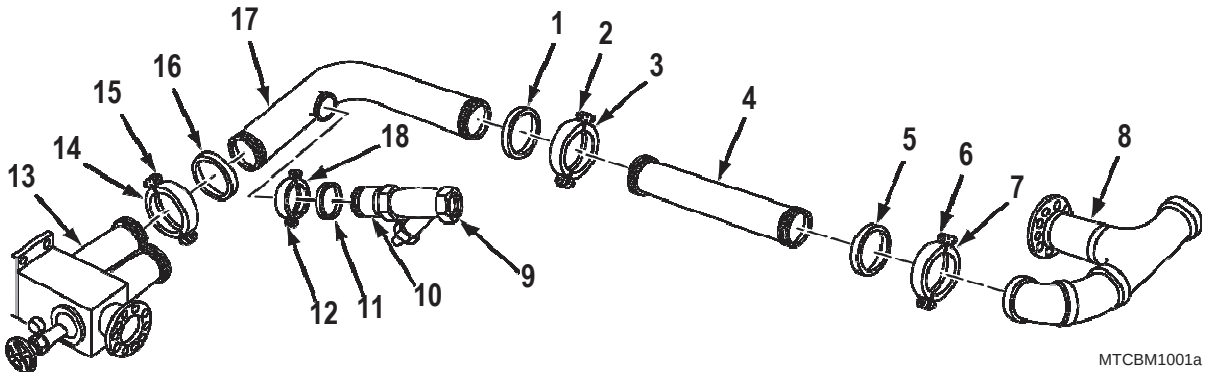

Figure 3. Centrifugal Pump Tubing Assembly Installation.

END OF TASK

FOLLOW ON TASK

1. Install batteries (WP 0097).
2. Install muffler and exhaust pipe (WP 0213).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
PIPING CONTROL ASSEMBLY REPLACEMENT (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 21)
Nut, Self-Locking
Qty: (13) (WP 0295, Table 1, Item 166)

Equipment Condition
B valve assembly removed (WP 0273)

Equipment Condition (cont.)
F valve assembly removed (WP 0273)
G valve assembly removed (WP 0280)
K valve assembly removed (WP 0256)
Semitrailer uncoupled (WP 0007)
Tank drained and purged (WP 0012)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove eight self-locking nuts (Figure 1, Item 11), washers (Figure 1, Item 12), access cover (Figure 1, Item 13), gasket (Figure 1, Item 1), and screws (Figure 1, Item 3) from discharge manifold (Figure 1, Item 2). Discard self-locking nuts (Figure 1, Item 11) and gasket (Figure 1, Item 1).
2. Remove three screws (Figure 1, Item 10), six washers (Figure 1, Item 9), and three self-locking nuts (Figure 1, Item 8) from discharge manifold (Figure 1, Item 2). Discard self-locking nuts (Figure 1, Item 8).
3. Remove two screws (Figure 1, Item 7), four washers (Figure 1, Item 6), two self-locking nuts (Figure 1, Item 5), and discharge manifold (Figure 1, Item 2) from piping control cabinet (Figure 1, Item 4). Discard self-locking nuts (Figure 1, Item 5).

END OF TASK

INSTALLATION

1. Secure discharge manifold (Figure 1, Item 2) in piping control cabinet (Figure 1, Item 4) with two screws (Figure 1, Item 7), four washers (Figure 1, Item 6), and two new self-locking nuts (Figure 1, Item 5).
2. Install three screws (Figure 1, Item 10), six washers (Figure 1, Item 9), and three new self-locking nuts (Figure 1, Item 8) on discharge manifold (Figure 1, Item 2).
3. Install access cover (Figure 1, Item 13) and new gasket (Figure 1, Item 1) on discharge manifold (Figure 1, Item 2) with eight screws (Figure 1, Item 3), washer (Figure 1, Item 12), and new self-locking nuts (Figure 1, Item 11).

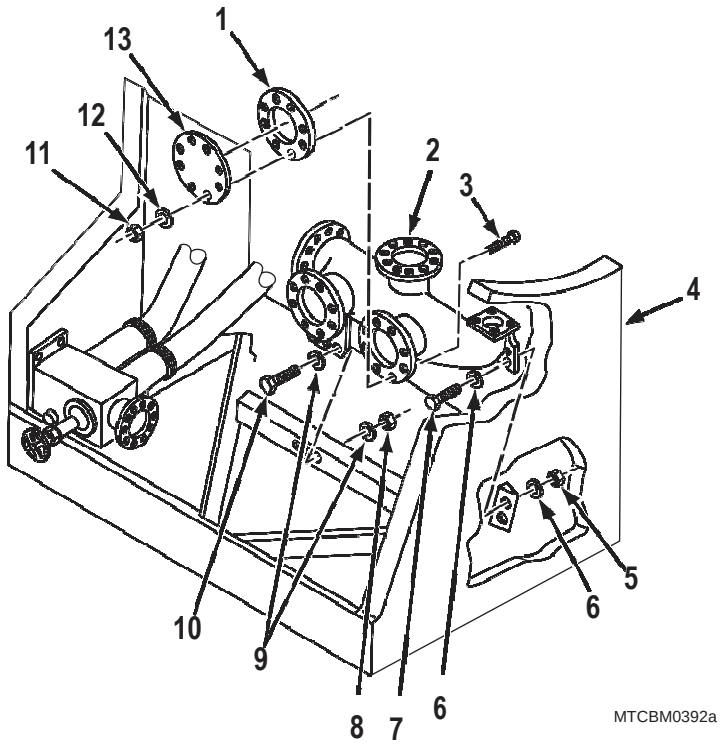

Figure 1. Piping Control Assembly Installation.

END OF TASK

FOLLOW ON TASK

1. Install G valve assembly (WP 0273).
2. Install B valve assembly (WP 0273).
3. Install F valve assembly (WP 0273).
4. Install K valve assembly (WP 0256).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
PIPING CONTROL ASSEMBLY REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 21)
Gasket (WP 0295, Table 1, Item 137)
Gasket Qty: (2) (WP 0295, Table 1, Item 22)
Nut, Self-Locking
Qty: (16) (WP 0295, Table 1, Item 166)

Equipment Condition
B valve assembly removed (WP 0273)

Equipment Condition (cont.)
F valve assembly removed (WP 0273)
G valve assembly removed (WP 0280)
K valve assembly removed (WP 0256)
Semitrailer uncoupled (WP 0007)
Tank drained and purged (WP 0012)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove cap (Figure 1, Item 11) and gasket (Figure 1, Item 12) from adapter (Figure 1, Item 13). Discard gasket (Figure 1, Item 12).
2. Remove four screws (Figure 1, Item 6), flatwashers (Figure 1, Item 9), self-locking nuts (Figure 1, Item 10), adapter (Figure 1, Item 13), and gasket (Figure 1, Item 8) from valve (Figure 1, Item 7). Discard gasket (Figure 1, Item 8) and self-locking nuts (Figure 1, Item 10).
3. Remove four screws (Figure 1, Item 17), flatwashers (Figure 1, Item 15), self-locking nuts (Figure 1, Item 14), valve (Figure 1, Item 7), and gasket (Figure 1, Item 16) from adapter (Figure 1, Item 18). Discard gasket (Figure 1, Item 16) and self-locking nuts (Figure 1, Item 14).
4. Remove eight screws (Figure 1, Item 5), flatwashers (Figure 1, Item 3), and self-locking nuts (Figure 1, Item 4) from adapter (Figure 1, Item 18) and remove adapter and gasket (Figure 1, Item 1) from manifold (Figure 1, Item 2). Discard gasket (Figure 1, Item 1) and self-locking nuts (Figure 1, Item 4).

END OF TASK

INSTALLATION

1. Install adapter (Figure 1, Item 18) and gasket (Figure 1, Item 1) on manifold (Figure 1, Item 2) with eight screws (Figure 1, Item 5), flatwashers (Figure 1, Item 3), and new self-locking nuts (Figure 1, Item 4).
2. Install valve (Figure 1, Item 7) and new gasket (Figure 1, Item 16) on adapter (Figure 1, Item 18) with four screws (Figure 1, Item 17), flatwashers (Figure 1, Item 15), and new self-locking nuts (Figure 1, Item 14).
3. Install adapter (Figure 1, Item 13) and new gasket (Figure 1, Item 8) on valve (Figure 1, Item 7) with four screws (Figure 1, Item 6), flatwashers (Figure 1, Item 9), and new self-locking nuts (Figure 1, Item 10).
4. Install cap (Figure 1, Item 11) and new gasket (Figure 1, Item 12) on adapter (Figure 1, Item 13).

INSTALLATION - Continued

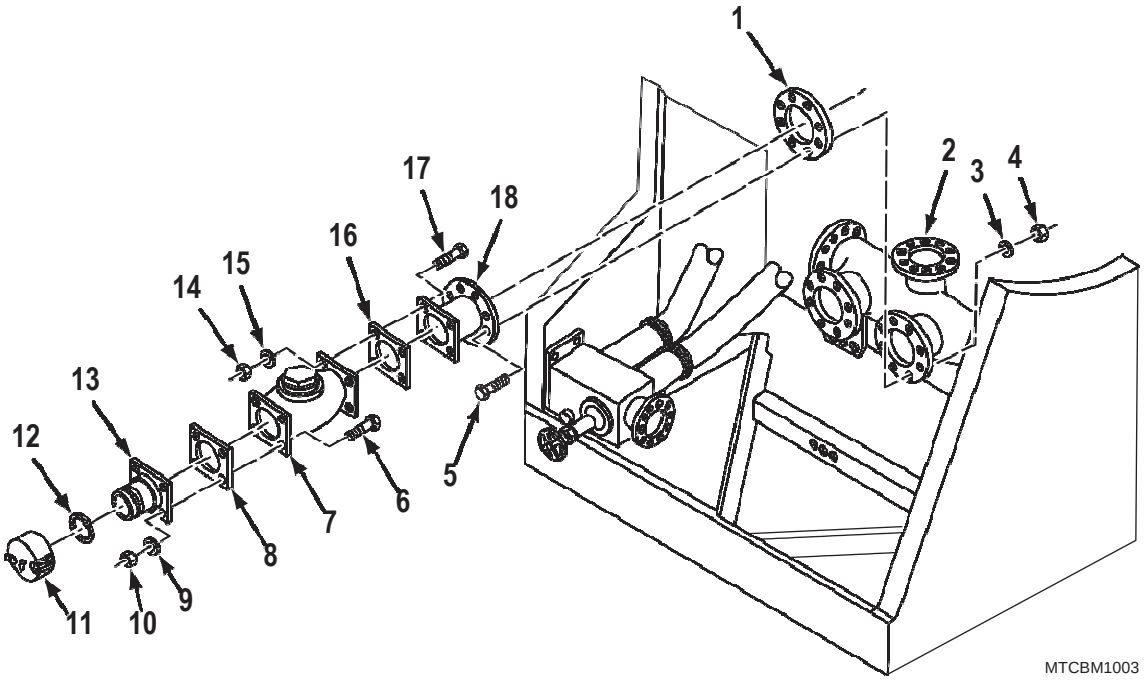

Figure 1. Piping Control Assembly Replacement (M970A1).

END OF TASK

FOLLOW ON TASK

1. Install G valve assembly (WP 0273).
2. Install B valve assembly (WP 0273).
3. Install F valve assembly (WP 0273).
4. Install K valve assembly (WP 0256).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
K VALVE AND PIPING CONTROL ASSEMBLY ANGLE VALVE MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Materials/Parts
- Gasket Qty: (2) (WP 0295, Table 1, Item 22)
- Nut, Self-Locking Qty: (8) (WP 0295, Table 1, Item 173)
- Packing, Preformed

Materials/Parts (cont.)
- (WP 0295, Table 1, Item 102)
- Rag, Wiping (WP 0293, Table 1, Item 20)
- Seal, Nonmetallic (WP 0295, Table 1, Item 16)
- Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)

Equipment Condition
- Semitrailer uncoupled WP 0007
- Piping control valve removed

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove seal (Figure 1, Item 4), two screws (Figure 1, Item 5), coupling (Figure 1, Item 6), and pipe (Figure 1, Item 7) from adapter (Figure 1, Item 1). Discard seal (Figure 1, Item 4).
2. Remove four screws (Figure 1, Item 9), washers (Figure 1, Item 11), self-locking nuts (Figure 1, Item 12), one gasket (Figure 1, Item 10), and K valve (Figure 1, Item 14) from piping control manifold (Figure 1, Item 13). Discard self-locking nuts (Figure 1, Item 12) and gasket (Figure 1, Item 10).
3. Remove four screws (Figure 1, Item 15), washers (Figure 1, Item 2), self-locking nuts (Figure 1, Item 3), one gasket (Figure 1, Item 8), and adapter (Figure 1, Item 1) from K valve (Figure 1, Item 14). Discard self-locking nuts (Figure 1, Item 3) and gasket (Figure 1, Item 8).

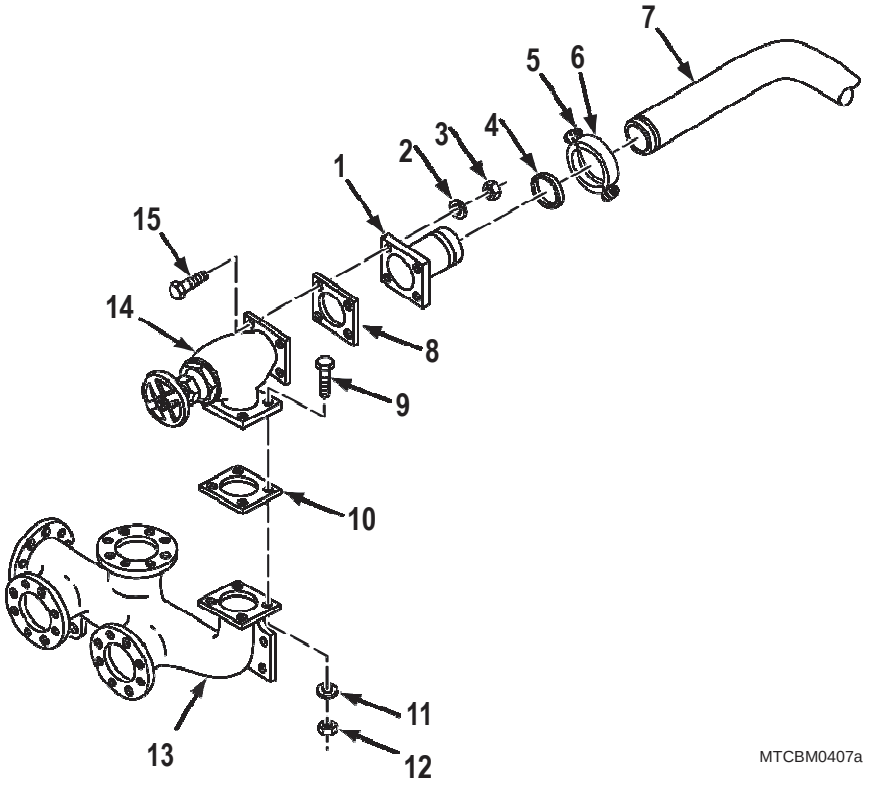

Figure 1. K Valve Removal.

END OF TASK

DISASSEMBLY

1. Loosen packing nut (Figure 2, Item 10) and turn hand wheel (Figure 2, Item 11) counterclockwise to force packing (Figure 2, Item 8) and packing gland (Figure 2, Item 9) free of bonnet (Figure 2, Item 7).
2. Remove nut (Figure 2, Item 12) and handwheel (Figure 2, Item 11).
3. Remove packing nut (Figure 2, Item 10), spring (Figure 2, Item 13), bonnet (Figure 2, Item 7), and packing (Figure 2, Item 8). Discard packing (Figure 2, Item 8).
4. Remove bonnet (Figure 2, Item 7) from body (Figure 2, Item 6).
5. Remove disc nut (Figure 2, Item 5) from stem (Figure 2, Item 2).
6. Remove disc seal (Figure 2, Item 4) from disc holder (Figure 2, Item 3).
7. Remove disc ring (Figure 2, Item 1) from bonnet (Figure 2, Item 7).

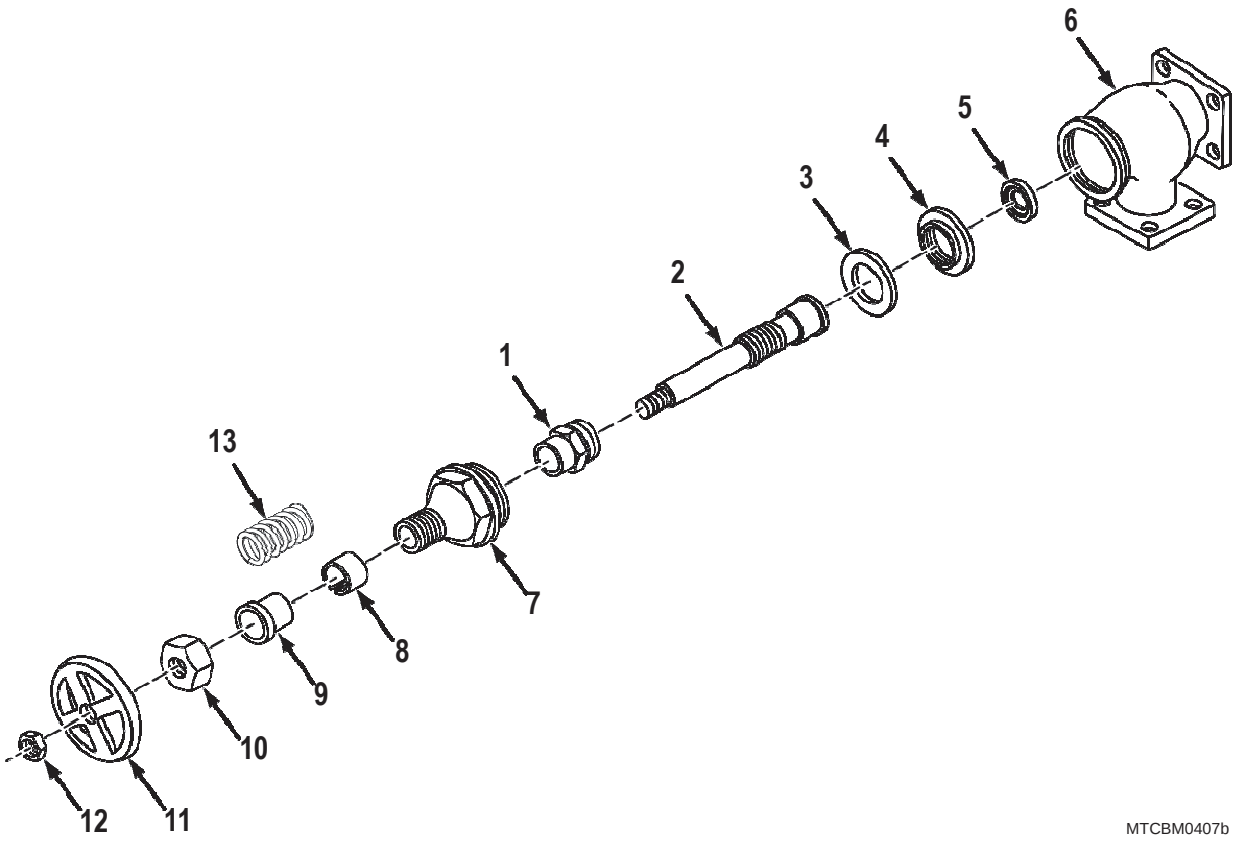

Figure 2. Piping Control Angle Valve Disassembly (M970A1).

END OF TASK

CLEANING AND INSPECTION

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Clean all metal parts with solvent and clean dry rags.
2. Inspect metal parts for cracks, scoring, and pitting. Replace any damaged parts.

END OF TASK

ASSEMBLY

1. Install disc ring (Figure 3, Item 1), disc holder (Figure 3, Item 3), disc seal (Figure 3, Item 4), and disc nut (Figure 3, Item 5) on stem (Figure 3, Item 2).
2. Place assembled stem (Figure 3, Item 2) and disc inside body (Figure 3, Item 6).
3. Install bonnet (Figure 3, Item 7) and tighten.
4. Install new packing (Figure 3, Item 8), packing gland (Figure 3, Item 9), spring (Figure 3, Item 13), and packing nut (Figure 3, Item 10). Tighten packing nut (Figure 3, Item 10) two full turns.
5. Install handwheel (Figure 3, Item 11) and nut (Figure 3, Item 12) on stem (Figure 3, Item 2).

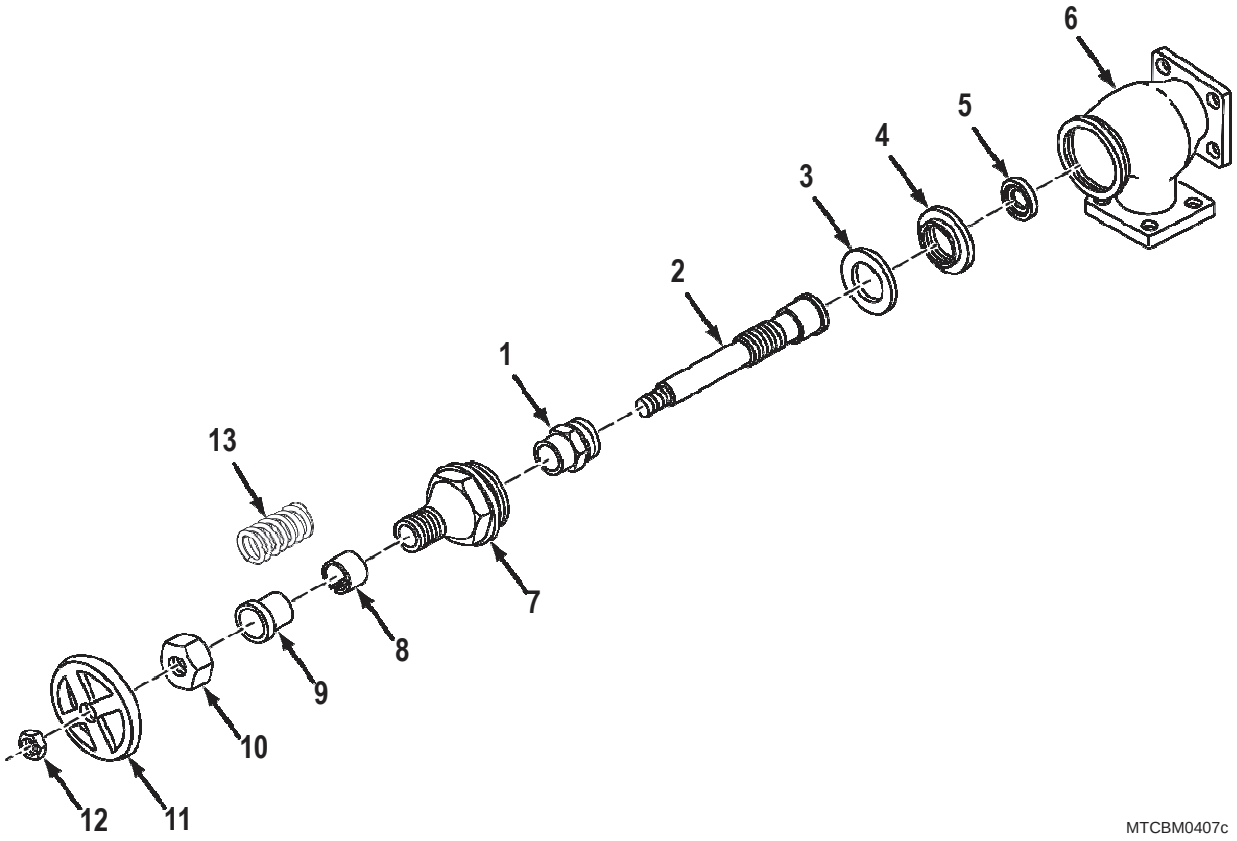

Figure 3. Piping Control Angle Valve Assembly (M970A1).

END OF TASK

INSTALLATION

1. Install adapter (Figure 4, Item 1) and new gasket (Figure 4, Item 8) on K valve (Figure 4, Item 14) with four screws (Figure 4, Item 15), washers (Figure 4, Item 2), and new self-locking nuts (Figure 4, Item 3).
2. Install K valve (Figure 4, Item 14) and new gasket (Figure 4, Item 10) on piping control manifold (Figure 4, Item 13) with four screws (Figure 4, Item 9), washers (Figure 4, Item 11), and new self-locking nuts (Figure 4, Item 12).
3. Install pipe (Figure 4, Item 7), new seal (Figure 4, Item 4), and coupling (Figure 4, Item 6) on adapter (Figure 4, Item 1) with two screws (Figure 4, Item 5).

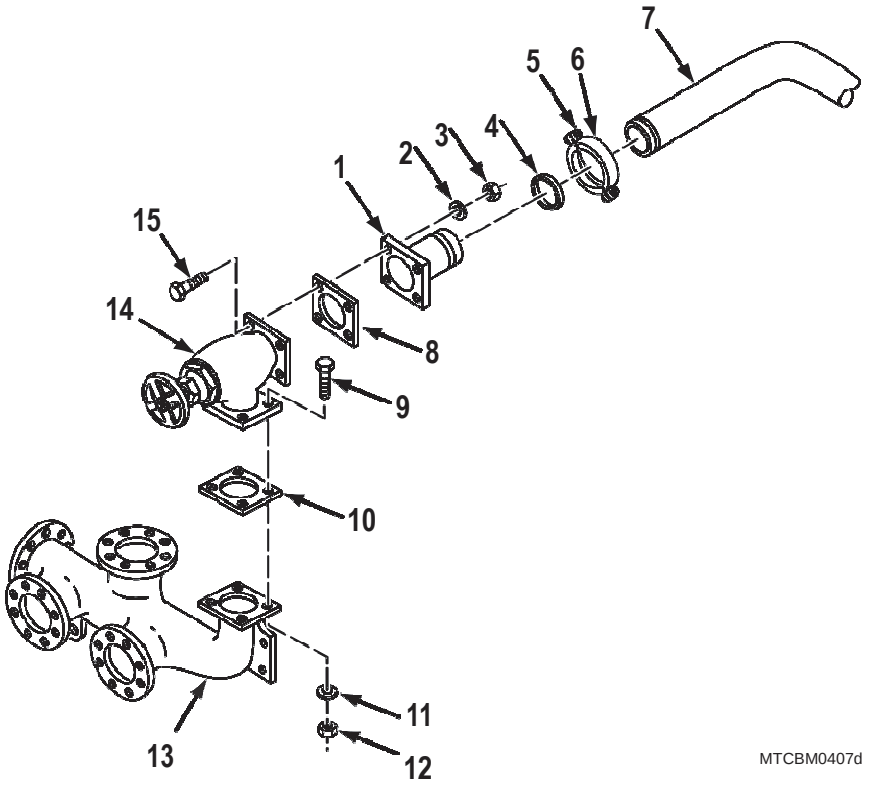

Figure 4. K Valve Installation.

END OF TASK

FOLLOW ON TASK

Install piping control valve.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CABINET PIPING ASSEMBLY REPLACEMENT (M969A1 AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (12) (WP 0295, Table 1, Item 166)
Seal, Nonmetallic

Materials/Parts (cont.)
Qty: (3) (WP 0295, Table 1, Item 10)
Seal, Nonmetallic
Qty: (2) (WP 0295, Table 1, Item 11)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Tank drained and purged (WP 0012)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove two screws (Figure 1, Item 6), coupling (Figure 1, Item 7), seal (Figure 1, Item 8), and pipe (Figure 1, Item 9) from filter separator (Figure 1, Item 5). Discard seal (Figure 1, Item 8).
2. Remove two screws (Figure 1, Item 3), coupling (Figure 1, Item 4), seal (Figure 1, Item 2), and pipe (Figure 1, Item 1) from pipe (Figure 1, Item 9). Discard seal (Figure 1, Item 2).
3. Remove two screws (Figure 1, Item 17), coupling (Figure 1, Item 16), seal (Figure 1, Item 15), and pipe (Figure 1, Item 9) from piping (Figure 1, Item 14). Discard seal (Figure 1, Item 15).
4. Remove two screws (Figure 1, Item 12), coupling (Figure 1, Item 13), seal (Figure 1, Item 11), and pipe (Figure 1, Item 10) from piping (Figure 1, Item 14). Discard seal (Figure 1, Item 11).

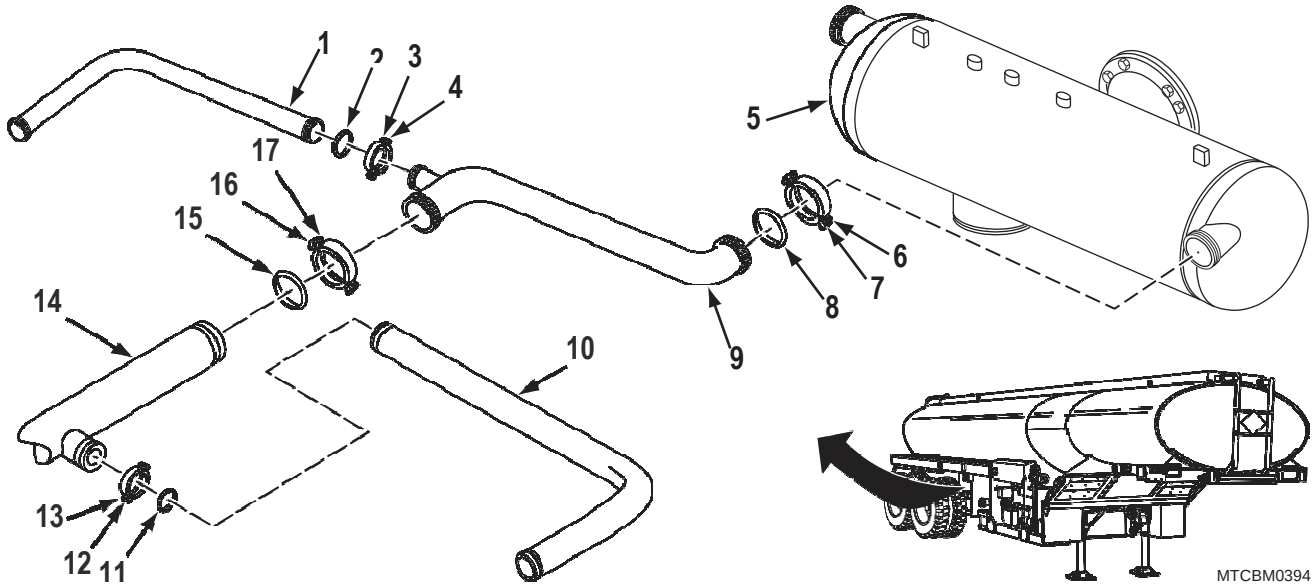

Figure 1. Cabinet Piping Assembly Removal.

5. Remove two screws (Figure 2, Item 32), coupling (Figure 2, Item 31), seal (Figure 2, Item 30), and pipe (Figure 2, Item 1) from valve K (Figure 2, Item 29). Discard seal (Figure 2, Item 30).
6. Remove two screws (Figure 2, Item 26), coupling (Figure 2, Item 25), seal (Figure 2, Item 27), and piping (Figure 2, Item 6) from cabinet piping assembly (Figure 2, Item 21). Discard seal (Figure 2, Item 27).
7. Remove two screws (Figure 2, Item 12), coupling (Figure 2, Item 13), seal (Figure 2, Item 11), and pipe (Figure 2, Item 10) from cabinet piping (Figure 2, Item 16). Discard seal (Figure 2, Item 11).
8. Remove six screws (Figure 2, Item 15), self-locking nuts (Figure 2, Item 19), valve R (Figure 2, Item 17), and cabinet piping (Figure 2, Item 16) from piping (Figure 2, Item 18) on volumetric meter (Figure 2, Item 14). Discard self-locking nuts (Figure 2, Item 19).
9. Remove six screws (Figure 2, Item 20) and self-locking nuts (Figure 2, Item 24), valve P (Figure 2, Item 22), and cabinet piping assembly (Figure 2, Item 21) from piping (Figure 2, Item 23) on volumetric meter (Figure 2, Item 28). Discard self-locking nuts (Figure 2, Item 24).

END OF TASK

INSTALLATION

1. Install valve P (Figure 2, Item 22) and cabinet piping assembly (Figure 2, Item 21) on piping (Figure 2, Item 23) on volumetric meter (Figure 2, Item 28) with six screws (Figure 2, Item 20) and new self-locking nuts (Figure 2, Item 24).
2. Install valve R (Figure 2, Item 17) and cabinet piping (Figure 2, Item 16) on piping (Figure 2, Item 18) on volumetric meter (Figure 2, Item 14) with six screws (Figure 2, Item 15) and new self-locking nuts (Figure 2, Item 19).
3. Install cabinet piping (Figure 2, Item 16), new seal (Figure 2, Item 11), and coupling (Figure 2, Item 13) on pipe (Figure 2, Item 10) with two screws (Figure 2, Item 12).
4. Install cabinet piping assembly (Figure 2, Item 21), new seal (Figure 2, Item 27), and coupling (Figure 2, Item 25) on piping (Figure 2, Item 6) with two screws (Figure 2, Item 26).
5. Install pipe (Figure 2, Item 1), new seal (Figure 2, Item 30), and coupling (Figure 2, Item 32) on valve K (Figure 2, Item 29) with two screws (Figure 2, Item 31).
6. Install pipe (Figure 2, Item 10), new seal (Figure 2, Item 9), and coupling (Figure 2, Item 8) on piping (Figure 2, Item 6) with two screws (Figure 2, Item 7).
7. Install pipe (Figure 2, Item 5), new seal (Figure 2, Item 2), and coupling (Figure 2, Item 3) on piping (Figure 2, Item 6) with two screws (Figure 2, Item 4).

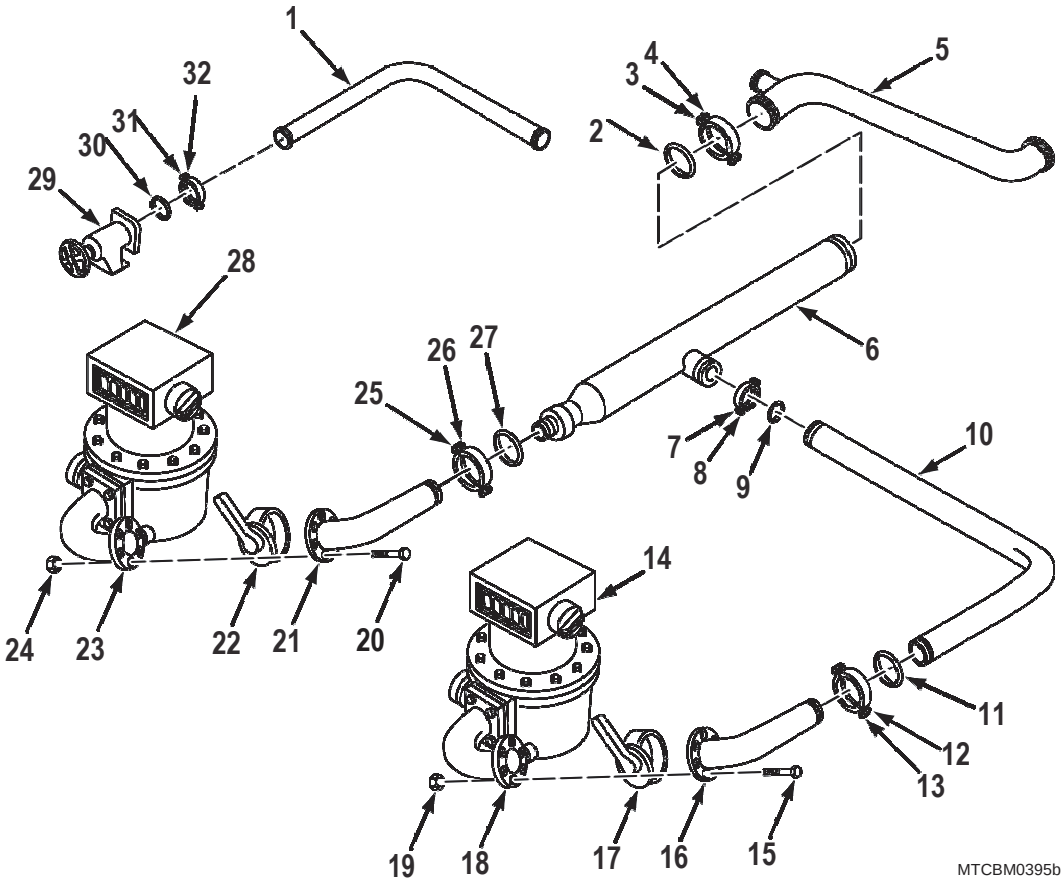

Figure 2. Cabinet Piping Assembly Replacement.

INSTALLATION - Continued

8. Install pipe (Figure 3, Item 6), new seal (Figure 3, Item 7), and coupling (Figure 3, Item 9) on pipe (Figure 3, Item 5) with two screws (Figure 3, Item 8).
9. Install pipe (Figure 3, Item 5), new seal (Figure 3, Item 4), and coupling (Figure 3, Item 3) on filter separator (Figure 3, Item 1) with two screws (Figure 3, Item 2).

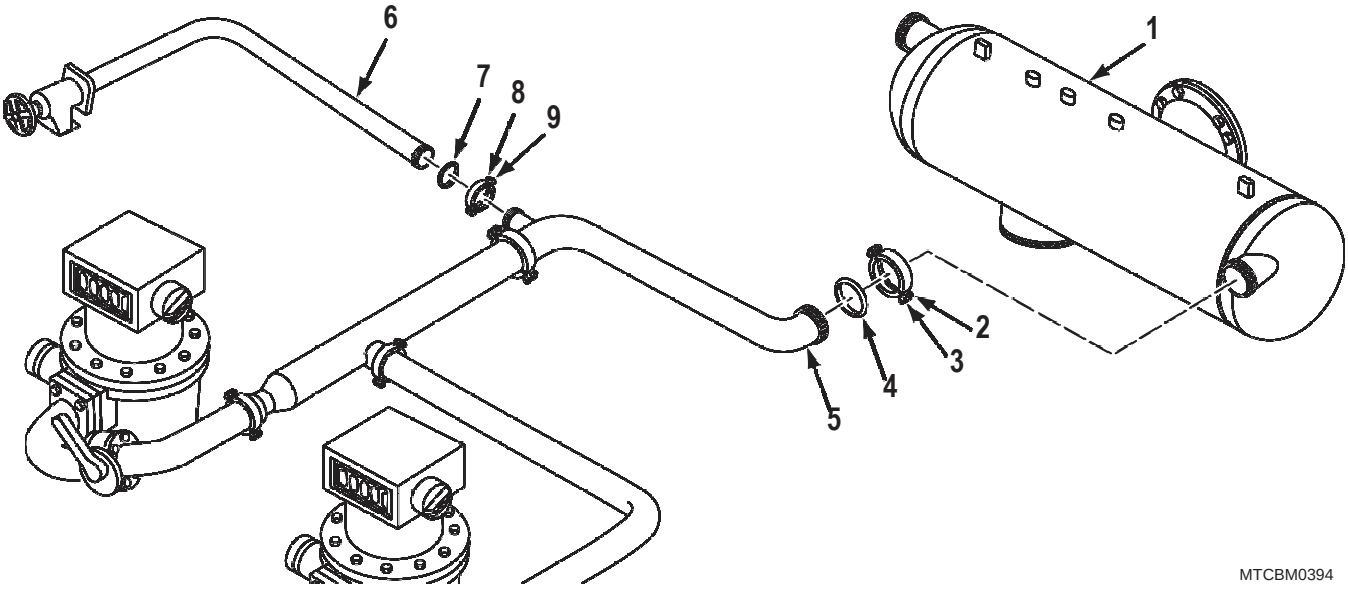

Figure 3. Cabinet Piping Assembly Replacement.

END OF TASK

FOLLOW ON TASK

Fill tank (WP 0012).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CABINET PIPING ASSEMBLY REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 166)
Seal, Nonmetallic

Materials/Parts (cont.)
Qty: (4) (WP 0295, Table 1, Item 11)
Seal, Nonmetallic
(WP 0295, Table 1, Item 207)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Tank drained and purged (WP 0012)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove two screws (Figure 1, Item 12), coupling (Figure 1, Item 11), seal (Figure 1, Item 13), and pipe (Figure 1, Item 9) from filter/separator (Figure 1, Item 10). Discard seal (Figure 1, Item 13).
2. Remove two screws (Figure 1, Item 7), coupling (Figure 1, Item 8), seal (Figure 1, Item 6), and pipe (Figure 1, Item 9) from valve (Figure 1, Item 5). Discard seal (Figure 1, Item 6).
3. Remove two screws (Figure 1, Item 3), coupling (Figure 1, Item 4), and seal (Figure 1, Item 2) from pipe (Figure 1, Item 1). Discard seal (Figure 1, Item 2).
4. Remove two screws (Figure 1, Item 23), coupling (Figure 1, Item 22), and seal (Figure 1, Item 21) from pipe (Figure 1, Item 20). Discard seal (Figure 1, Item 21).
5. Remove two screws (Figure 1, Item 14), coupling (Figure 1, Item 15), seal (Figure 1, Item 16), four self-locking nuts (Figure 1, Item 19), and pipe (Figure 1, Item 17) from meter (Figure 1, Item 18). Discard seal (Figure 1, Item 16) and self-locking nuts (Figure 1, Item 19).

END OF TASK

INSTALLATION

1. Install pipe (Figure 1, Item 17), four new self-locking nuts (Figure 1, Item 19), new seal (Figure 1, Item 16), coupling (Figure 1, Item 15), and two screws (Figure 1, Item 14) on meter (Figure 1, Item 18).
2. Install new seal (Figure 1, Item 21), coupling (Figure 1, Item 22), two screws (Figure 1, Item 23), and pipe (Figure 1, Item 1) on pipe (Figure 1, Item 20).
3. Install valve (Figure 1, Item 5), new seal (Figure 1, Item 2), coupling (Figure 1, Item 4), and two screws (Figure 1, Item 3) on pipe (Figure 1, Item 1).
4. Install new seal (Figure 1, Item 6), coupling (Figure 1, Item 8), two screws (Figure 1, Item 7), and pipe (Figure 1, Item 9) on valve (Figure 1, Item 5).
5. Install two screws (Figure 1, Item 12), coupling (Figure 1, Item 11), new seal (Figure 1, Item 13), and pipe (Figure 1, Item 9) on filter/separator (Figure 1, Item 10).

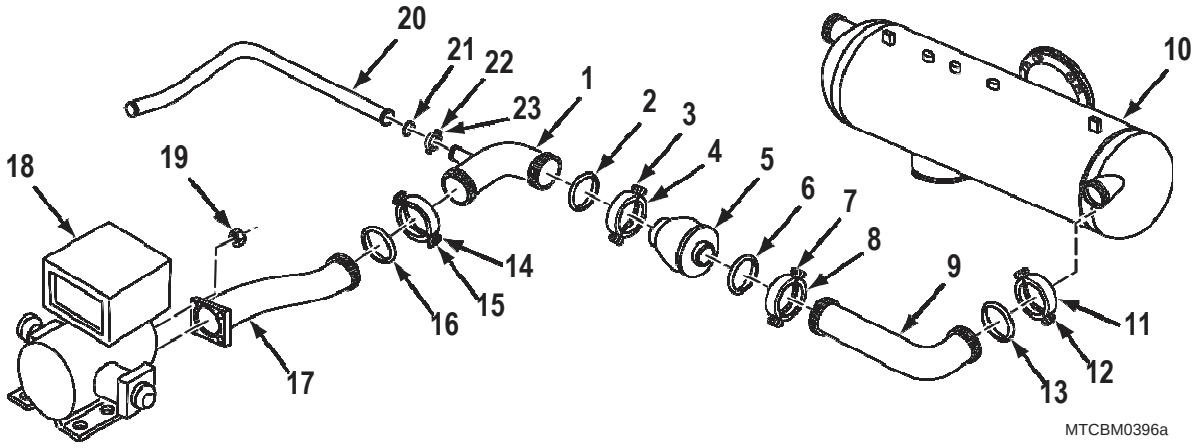

Figure 1. Cabinet Piping Assembly Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
METER INLET PRESSURE GAGE REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
WP 0086
WP 0285

Materials/Parts
Nut, Self-Locking
Qty: (4) (WP 0295, Table 1, Item 166)

Equipment Condition
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Tag all wires, hoses, tubing, and connections prior to removal for ease of installation.

REMOVAL

1. Disconnect hose (Figure 1, Item 6) from tube fitting (Figure 1, Item 4) by loosening tube nut (Figure 1, Item 5).
2. Remove drain valve (Figure 1, Item 3) from gage (Figure 1, Item 1).
3. Remove two self-locking nuts (Figure 1, Item 7), two retaining plates (Figure 1, Item 2), and gage (Figure 1, Item 1). Discard self-locking nuts (Figure 1, Item 7).

END OF TASK

INSPECTION

Inspect hose for damage. Repair or replace if damaged (WP 0285).

END OF TASK

INSTALLATION

1. Install gage (Figure 1, Item 1), retaining plates (Figure 1, Item 2), and two nuts (Figure 1, Item 7).
2. Connect hose (Figure 1, Item 6) to tube fittings (Figure 1, Item 4) and tighten tube nut (Figure 1, Item 5).
3. Install drain valve (Figure 1, Item 3).

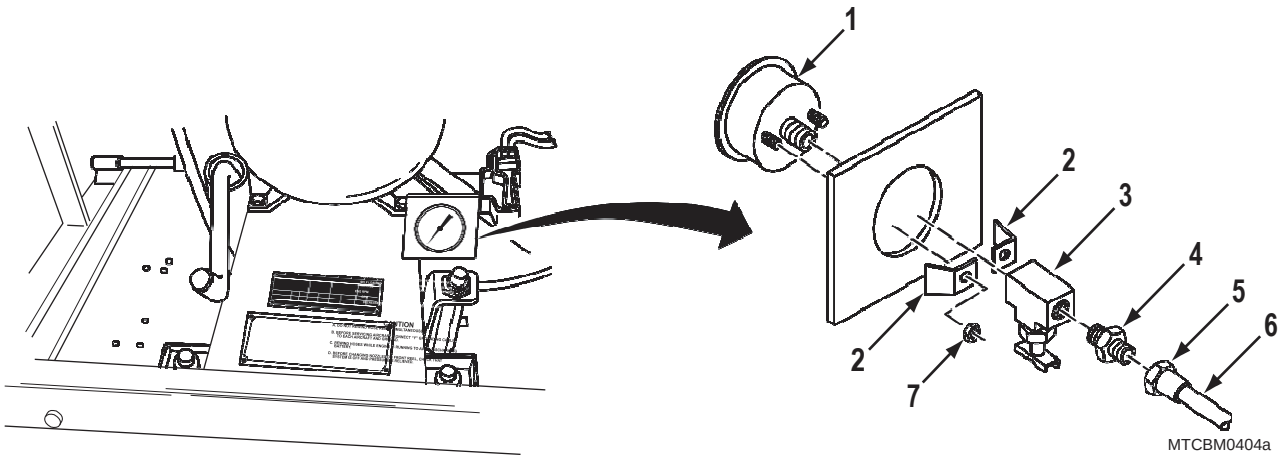

Figure 1. Meter Inlet Pressure Gage Installation.

END OF TASK

FOLLOW ON TASK

Perform leak test (WP 0086).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL-DISPENSING NOZZLE MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Materials/Parts
Rag, Wiping (WP 0293, Table 1, Item 20)
Solvent, Cleaning Compound

Materials/Parts (cont.)
(WP 0293, Table 1, Item 25)

Equipment Condition
All fuel-handling valves closed (WP 0008)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove fuel-dispensing nozzle (Figure 1, Item 3) from handle (Figure 1, Item 1).

NOTE

Cover end of hose with clean dry rag to keep out dirt and debris.

2. Drain fuel from nozzle (Figure 1, Item 3) and handle (Figure 1, Item 1).

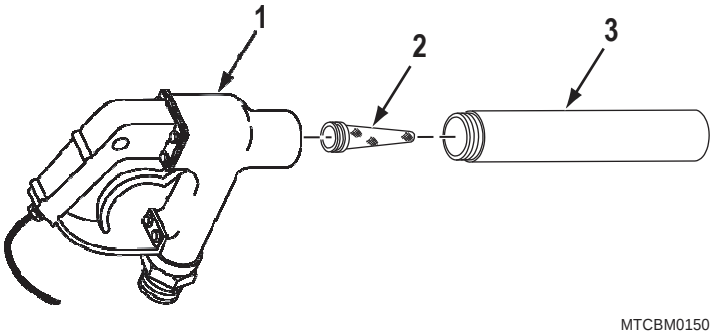

Figure 1. Fuel-Dispensing Nozzle Removal.

END OF TASK

SERVICE

NOTE

Screen in fuel-dispensing nozzle must be cleaned periodically and whenever flow through nozzle is restricted.

1. Remove handle (Figure 1, Item 1) from nozzle (Figure 1, Item 3).
2. Remove screen (Figure 1, Item 2) from inside of nozzle (Figure 1, Item 3).

SERVICE - Continued

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

3. Clean screen (Figure 1, Item 2) with solvent and clean dry rag. Use compressed air to dry screen and remove any excess material.
4. Install screen (Figure 1, Item 2) in nozzle (Figure 1, Item 3).
5. Install nozzle (Figure 1, Item 3) on handle (Figure 1, Item 1).

END OF TASK

INSTALLATION

Install nozzle (Figure 1, Item 3) on handle (Figure 1, Item 1).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HOSE REEL PIPING ASSEMBLY REPLACEMENT (M969A1 AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

Materials/Parts
Gasket (WP 0295, Table 1, Item 12)
Seal, Nonmetallic (WP 0295, Table 1, Item 207)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

There are two of these hose reel piping assemblies. This procedure covers the replacement of one. All others are replaced the same.

REMOVAL

1. Remove pipe plug (Figure 1, Item 5) from hose reel piping assembly (Figure 1, Item 4), if necessary.
2. Remove two screws (Figure 1, Item 7), nuts (Figure 1, Item 6), pipe coupling (Figure 1, Item 9), and seal (Figure 1, Item 10) from piping assembly (Figure 1, Item 4). Discard seal (Figure 1, Item 10).
3. Remove four nuts (Figure 1, Item 1), piping assembly (Figure 1, Item 4), and gasket (Figure 1, Item 3) from volumetric meter (Figure 1, Item 2), and hose reel (Figure 1, Item 8). Discard gasket (Figure 1, Item 3).

END OF TASK

INSTALLATION

1. Install new gasket (Figure 1 Item 3) and piping assembly (Figure 1, Item 4) on volumetric meter (Figure 1, Item 2) with four nuts (Figure 1, Item 1).
2. Install pipe coupling (Figure 1, Item 9) and new seal (Figure 1, Item 10) on piping assembly (Figure 1, Item 4). Install piping assembly (Figure 1, Item 4) on hose reel (Figure 1, Item 8) with two screws (Figure 1, Item 7) and nuts (Figure 1, Item 6).
3. Install pipe plug (Figure 1, Item 5) in piping assembly (Figure 1, Item 4), if necessary.

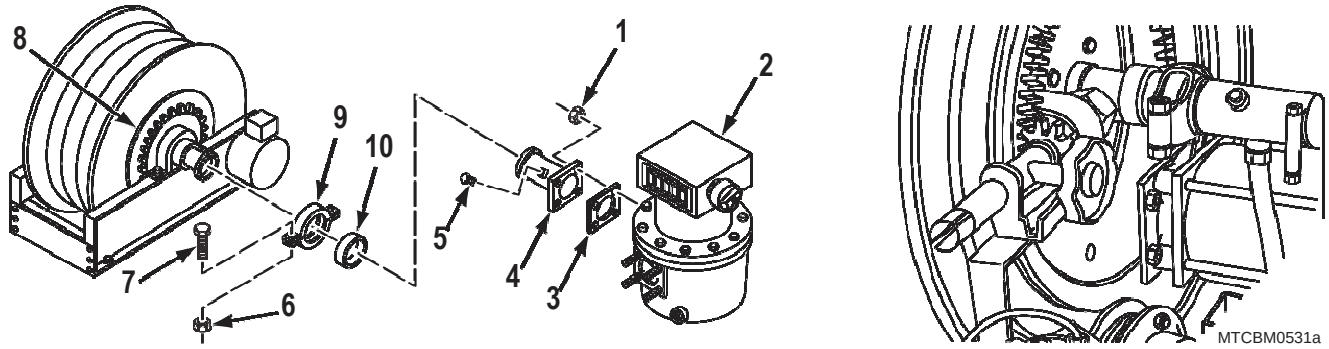

Figure 1. Hose Reel Piping Replacement (M969A1 and M969A2).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HOSE REEL PIPING ASSEMBLY REPLACEMENT (RIGHT) (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 12)
Seal, Nonmetallic

Materials/Parts (cont.)
Qty: (2) (WP 0295, Table 1, Item 207)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

This procedure covers the piping assembly to the right of the meter in the hose reel cabinet.

REMOVAL

1. Remove four screws (Figure 1, Item 7) and nuts (Figure 1, Item 6), and two pipe couplings (Figure 1, Item 3), and seals (Figure 1, Item 2) from hose reel (Figure 1, Item 5) and valve (Figure 1, Item 4). Discard seals (Figure 1, Item 2).
2. Remove four nuts (Figure 1, Item 1), meter outlet nipple (Figure 1, Item 8), and gasket (Figure 1, Item 9) from meter (Figure 1, Item 10). Discard gasket (Figure 1, Item 9).

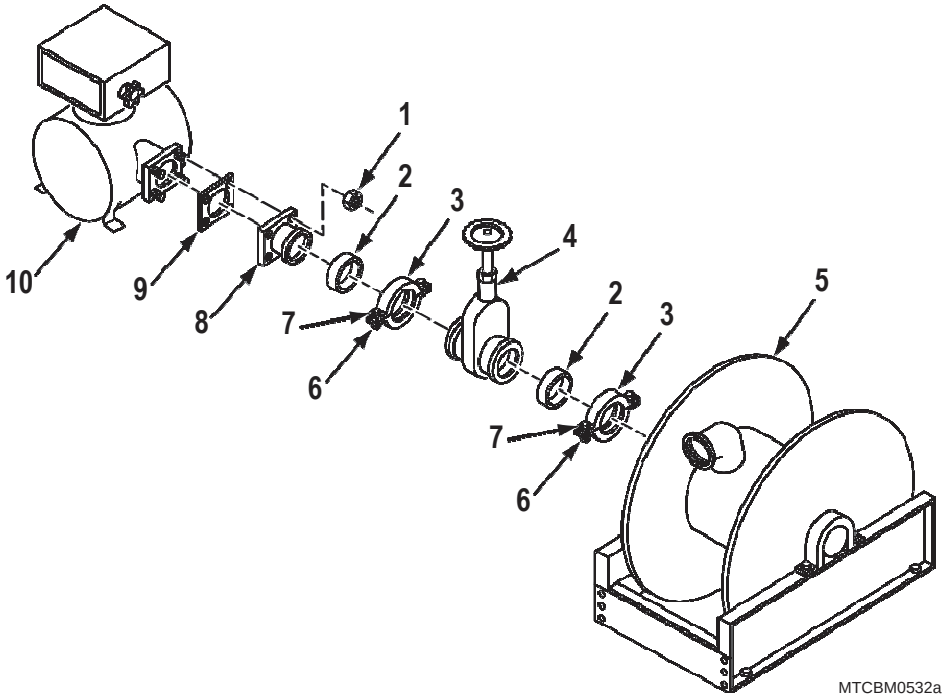

Figure 1. Hose Reel Piping Replacement (M970A1).

END OF TASK

DISASSEMBLY

Remove nut (Figure 2, Item 1), knob (Figure 2, Item 2), nut (Figure 2, Item 3), adapter (Figure 2, Item 4), three washers (Figure 2, Item 5), and flatwasher (Figure 2, Item 6) from valve housing (Figure 2, Item 7).

END OF TASK

ASSEMBLY

Install flatwasher (Figure 2, Item 6), three washers (Figure 2, Item 5), adapter (Figure 2, Item 4), nut (Figure 2, Item 3), knob (Figure 2, Item 2), and nut (Figure 2, Item 1) to valve housing (Figure 2, Item 7).

ASSEMBLY - Continued

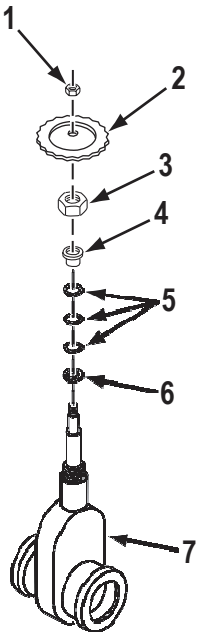

Figure 2. Valve Assembly Replacement (M970A1).

END OF TASK

INSTALLATION

1. Install new gasket (Figure 1, Item 9), four nuts (Figure 1, Item 1), and meter outlet nipple (Figure 1, Item 8) on meter (Figure 1, Item 10),
2. Install four screws (Figure 1, Item 7), nuts (Figure 1, Item 6), two pipe couplings (Figure 1, Item 3), and new seals (Figure 1, Item 2) on valve (Figure 1, Item 4) and hose reel (Figure 1, Item 5).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
HOSE REEL PIPING ASSEMBLY REPLACEMENT (LEFT) (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 12)
Seal, Nonmetallic

Materials/Parts (cont.)
Qty: (2) (WP 0295, Table 1, Item 207)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

This procedure covers the piping assembly to the left of the meter in the hose reel cabinet.

REMOVAL

1. Remove four screws (Figure 1, Item 9) and nuts (Figure 1, Item 8), and two pipe couplings (Figure 1, Item 2), and seals (Figure 1, Item 7) from hose reel (Figure 1, Item 10) and valve (Figure 1, Item 1). Discard seals (Figure 1, Item 7).
2. Remove four nuts (Figure 1, Item 3), meter outlet nipple (Figure 1, Item 4), and gasket (Figure 1, Item 5) from meter (Figure 1, Item 6). Discard gasket (Figure 1, Item 5).

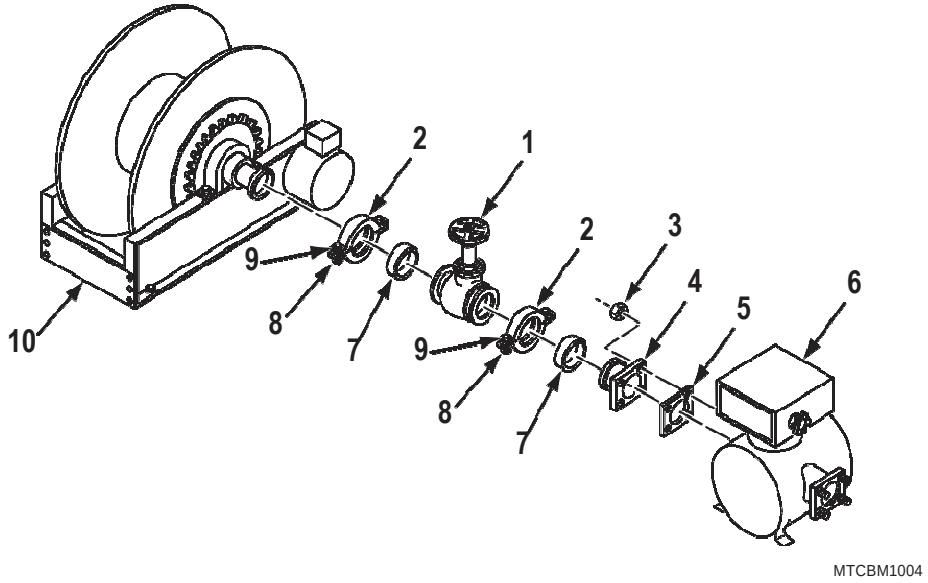

Figure 1. Hose Reel Piping Replacement (M970A1).

END OF TASK

DISASSEMBLY

1. Remove nut (Figure 2, Item 1), knob (Figure 2, Item 2), and nut (Figure 2, Item 3) from adapter (Figure 2, Item 4).
2. Remove adapter (Figure 2, Item 4), packing (Figure 2, Item 5), washer (Figure 2, Item 6), push rod (Figure 2, Item 7), and push rod roll (Figure 2, Item 8) from valve housing (Figure 2, Item 9).

END OF TASK

ASSEMBLY

1. Install push rod roll (Figure 2, Item 8), push rod (Figure 2, Item 7), washer (Figure 2, Item 6), packing (Figure 2, Item 5), and adapter (Figure 2, Item 4) on valve housing (Figure 2, Item 9).
2. Install adapter (Figure 2, Item 4), nut (Figure 2, Item 3), knob (Figure 2, Item 2), and nut (Figure 2, Item 1) on valve housing (Figure 2, Item 9).

ASSEMBLY - Continued

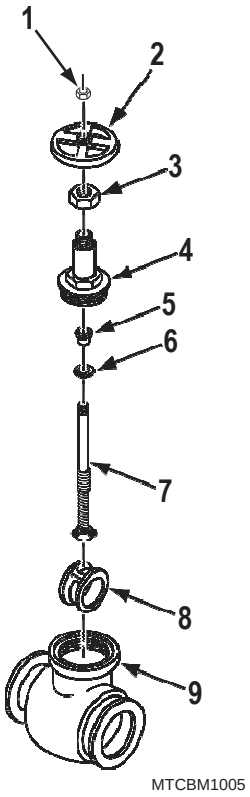

Figure 2. Valve Assembly Replacement (M970A1).

END OF TASK

INSTALLATION

1. Install new gasket (Figure 1, Item 5), four nuts (Figure 1, Item 3), and meter outlet nipple (Figure 1, Item 4) on meter (Figure 1, Item 6),
2. Install four screws (Figure 1, Item 9), nuts (Figure 1, Item 8), two pipe couplings (Figure 1, Item 2), and new seals (Figure 1, Item 7) on valve (Figure 1, Item 1) and hose reel (Figure 1, Item 10).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
UNDERWING NOZZLE ASSEMBLY MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Equipment Condition
Semitrailer uncoupled WP 0007

Materials/Parts
Solvent, Cleaning Compound
(WP 0293, Table 1, Item 25)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

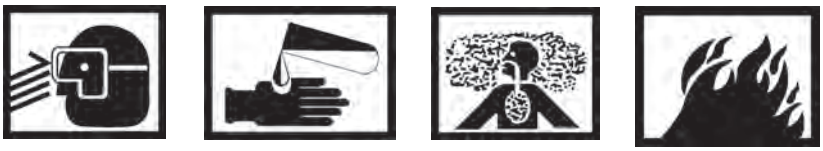
REMOVAL

1. Move red sleeve (Figure 1, Item 5) on coupling (Figure 1, Item 4) toward underwing nozzle (Figure 1, Item 1).
2. Move red sleeve (Figure 1, Item 5) and silver sleeve (Figure 1, Item 7) together back toward hose (Figure 1, Item 6).
3. Remove underwing nozzle (Figure 1, Item 1) from coupling (Figure 1, Item 4).
4. Remove adapter (Figure 1, Item 3) and screen (Figure 1, Item 2) from underwing nozzle (Figure 1, Item 1).

END OF TASK

CLEANING AND INSPECTION

WARNING



- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Clean screen with degreasing solvent and inspect for damage to screen.

END OF TASK

INSTALLATION

1. Install screen (Figure 1, Item 2) and adapter (Figure 1, Item 3) on underwing nozzle (Figure 1, Item 1).
2. Install nozzle (Figure 1, Item 1) into coupling (Figure 1, Item 4).
3. Move silver sleeve (Figure 1, Item 7) on coupling (Figure 1, Item 4) toward nozzle (Figure 1, Item 1).
4. Check for proper connection by trying to pull nozzle (Figure 1, Item 1) from hose (Figure 1, Item 6).

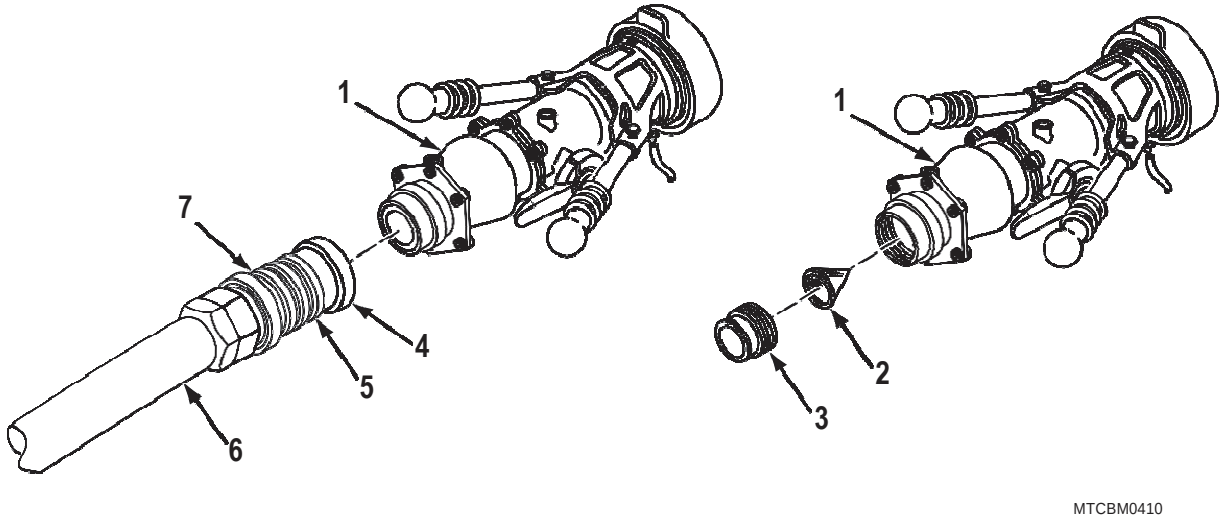


Figure 1. Underwing Nozzle Assembly Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
UNDERWING NOZZLE REPAIR (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 183)
Nut, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 172)
O-Ring (WP 0295, Table 1, Item 52)
O-Ring Qty: (2) (WP 0295, Table 1, Item 53)
Pin, Lock (WP 0295, Table 1, Item 2)

Materials/Parts (cont.)
Rag, Wiping (WP 0293, Table 1, Item 20)
Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)
Washer, Lock (WP 0295, Table 1, Item 146)
Wire, Lock (WP 0295, Table 1, Item 145)

Equipment Condition
Underwing nozzle removed (WP 0264)
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

DISASSEMBLY

1. Remove adapter (Figure 1, Item 26) from body (Figure 1, Item 25) by grasping knurled portion of adapter (Figure 1, Item 26) and turning counterclockwise.
2. Remove screen (Figure 1, Item 27) from body (Figure 1, Item 25).
3. Remove six capscrews (Figure 1, Item 28), washers (Figure 1, Item 29), and body (Figure 1, Item 25) from regulator (Figure 1, Item 21).
4. Remove O-ring (Figure 1, Item 24) from body (Figure 1, Item 25). Discard O-ring (Figure 1, Item 24).
5. Remove six capscrews (Figure 1, Item 23), washers (Figure 1, Item 22), and regulator (Figure 1, Item 21) from nozzle body (Figure 1, Item 6).
6. Remove two capscrews (Figure 1, Item 34), four washers (Figure 1, Item 32), two self-self-locking nuts (Figure 1, Item 31), and two handles (Figure 1, Item 30) from nozzle collar (Figure 1, Item 33). Discard self-self-locking nuts (Figure 1, Item 31).
7. Remove cover assembly (Figure 1, Item 3) by disconnecting latch at nozzle body (Figure 1, Item 6).
8. Remove capscrew (Figure 1, Item 11), lockwasher (Figure 1, Item 10), and crank handle (Figure 1, Item 12) from crank (Figure 1, Item 18). Discard lockwasher (Figure 1, Item 10).
9. Remove fiber washer (Figure 1, Item 13) from crank (Figure 1, Item 18).
10. Remove lock wire (Figure 1, Item 7) attached between bushing (Figure 1, Item 16) and nozzle body (Figure 1, Item 6). Discard lock wire (Figure 1, Item 7).
11. Loosen bushing (Figure 1, Item 16) and slide off crank (Figure 1, Item 18).
12. Remove spacer (Figure 1, Item 9) from inside bushing (Figure 1, Item 16).
13. Remove O-ring (Figure 1, Item 14) from inside bushing (Figure 1, Item 16), taking care not to disturb two flatwashers (Figure 1, Item 8) and wave washers (Figure 1, Item 15) located directly behind O-ring (Figure 1, Item 14). Discard O-ring (Figure 1, Item 14).
14. Remove gasket (Figure 1, Item 17) from beneath head of bushing (Figure 1, Item 16). Discard gasket (Figure 1, Item 17).
15. Remove lock pin (Figure 1, Item 20) from crank (Figure 1, Item 18). Remove crank (Figure 1, Item 18). Discard lock pin (Figure 1, Item 20).

NOTE

It may be necessary to apply heat to bumper using heat lamps to soften bumper. This usually takes 1 to 2 hours.

16. Pry bumper (Figure 1, Item 2) off nozzle assembly.
17. Remove bearing (Figure 1, Item 1) by applying force to end of bearing visible through opening of collar (Figure 1, Item 33) with a straight punch until opposite end of bearing protrudes through collar. Grasp this end with pliers and remove bearing.
18. Remove collar (Figure 1, Item 33).
19. Push shaft assembly (Figure 1, Item 19) to move valve (Figure 1, Item 4) as far out of body (Figure 1, Item 6) as possible and remove O-ring (Figure 1, Item 5). Discard O-ring (Figure 1, Item 5).

DISASSEMBLY - Continued

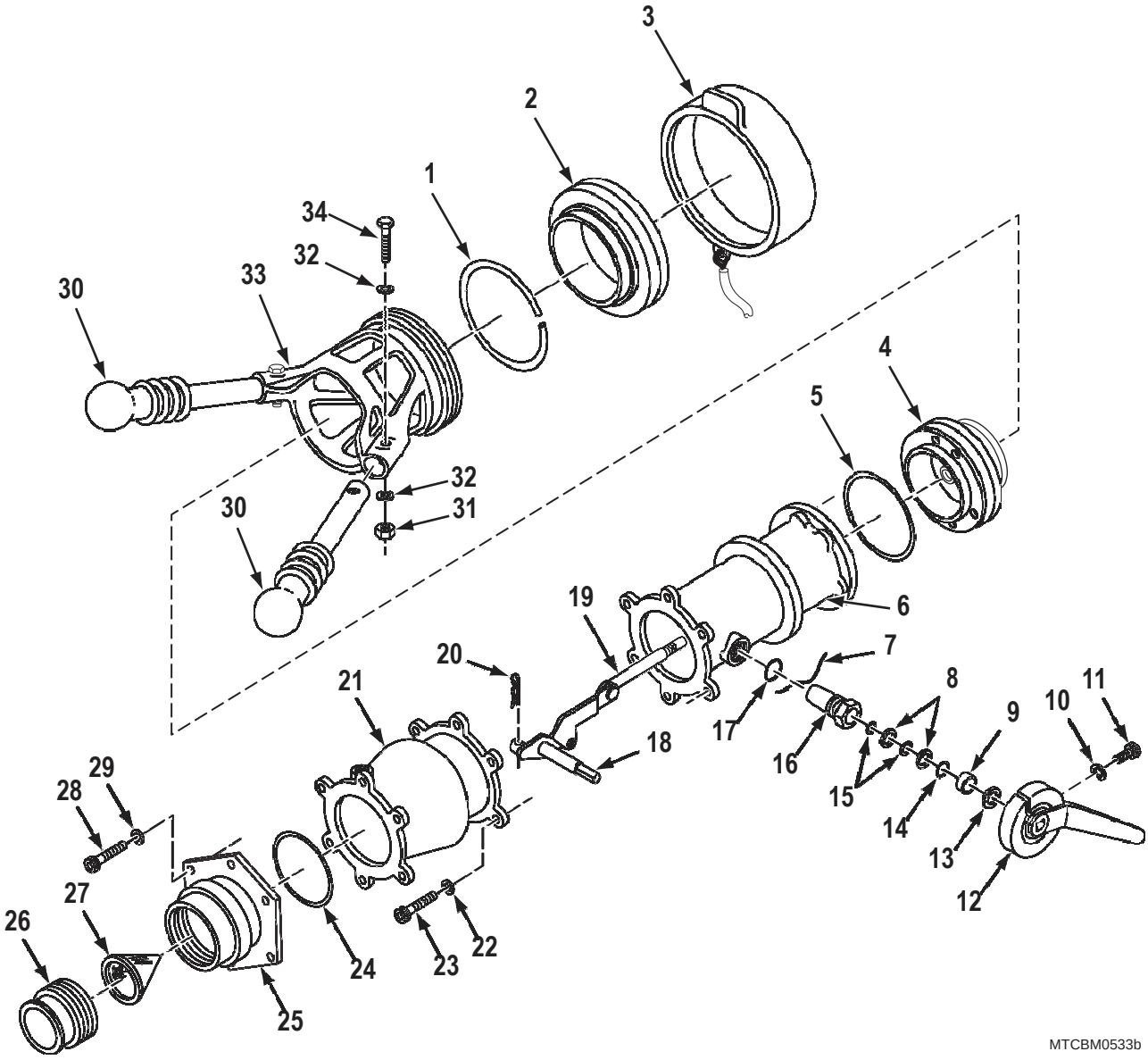

Figure 1. Hose Reel Piping Disassembly.

END OF TASK

ASSEMBLY

1. With valve (Figure 2, Item 4) in full open position, install new O-ring (Figure 2, Item 5) into nozzle body (Figure 2, Item 6).
2. Align groove in collar (Figure 2, Item 33) with boss in nozzle body (Figure 2, Item 6) and install collar (Figure 2, Item 33) onto nozzle body (Figure 2, Item 6).
3. Install bearing (Figure 2, Item 1) by pushing bearing through opening in collar (Figure 2, Item 33) into groove in nozzle body (Figure 2, Item 6).

NOTE

It may be necessary to apply heat to bumper using heat lamps to soften bumper. This usually takes 1 to 2 hours.

4. Install bumper (Figure 2, Item 2).
5. Insert crank (Figure 2, Item 18) through shaft (Figure 2, Item 19). Position shaft at 12:00 when crank is at 3:00.
6. Install new lock pin (Figure 2, Item 20) into crank (Figure 2, Item 18).
7. Install new gasket (Figure 2, Item 17) over bushing (Figure 2, Item 16).
8. Install bushing (Figure 2, Item 16) into nozzle body (Figure 2, Item 6).
9. Install new lock wire (Figure 2, Item 7) between bushing (Figure 2, Item 16) and nozzle body (Figure 2, Item 6).
10. Insert new O-ring (Figure 2, Item 14) into bushing (Figure 2, Item 16), over flat washers (Figure 2, Item 8) and wave washers (Figure 2, Item 15).
11. Insert spacer (Figure 2, Item 9) into bushing (Figure 2, Item 16), over O-ring (Figure 2, Item 14).
12. Install fiber washers (Figure 2, Item 13) over crank (Figure 2, Item 18). Use a wrench to turn crank (Figure 2, Item 18) counterclockwise and fully close valve (Figure 2, Item 4).
13. Align groove in crank handle (Figure 2, Item 12) with screw hole in crank (Figure 2, Item 18). Install screw (Figure 2, Item 11) and new lockwasher (Figure 2, Item 10).
14. Install cover assembly (Figure 2, Item 3) by securing latch to nozzle body (Figure 2, Item 6).
15. Install two capscrews (Figure 2, Item 34), four washers (Figure 2, Item 32), two new self-self-locking nuts (Figure 2, Item 31) and two handles (Figure 2, Item 30).
16. Install new O-ring (Figure 2, Item 24) to regulator (Figure 2, Item 21), indicated with arrow pointing in direction of flow.
17. Install six capscrews (Figure 2, Item 23), washers (Figure 2, Item 22), and regulator (Figure 2, Item 21) on nozzle body (Figure 2, Item 6), observing direction of flow.
18. Install new O-ring (Figure 2, Item 24) on body (Figure 2, Item 25).
19. Install six capscrews (Figure 2, Item 28), washers (Figure 2, Item 29), and body (Figure 2, Item 25) on regulator (Figure 2, Item 21).
20. Insert screen (Figure 2, Item 27) into body (Figure 2, Item 25).
21. Install adapter (Figure 2, Item 26) into body (Figure 2, Item 25).

ASSEMBLY - Continued

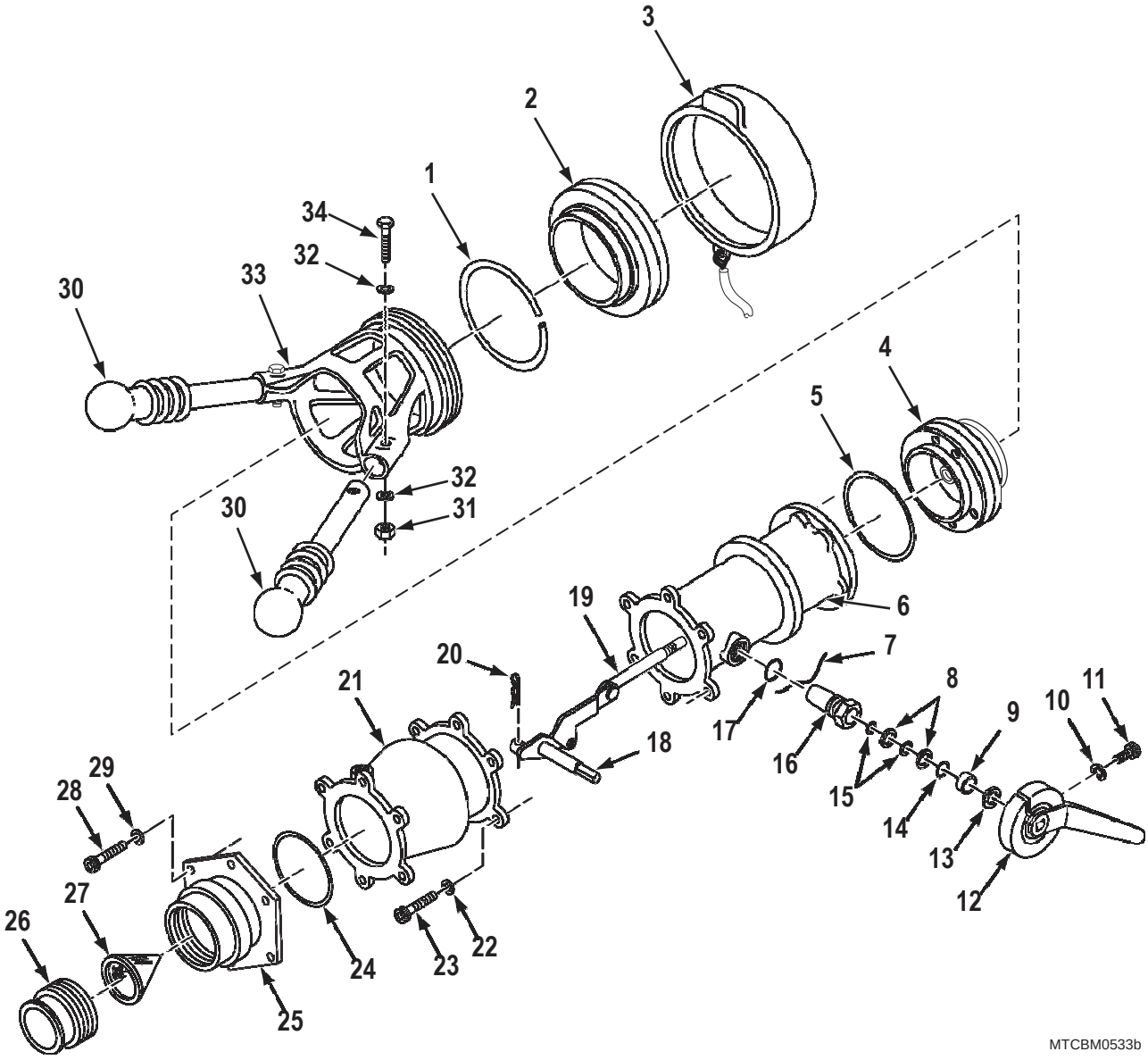

Figure 2. Hose Reel Piping Assembly.

END OF TASK

FOLLOW ON TASK

Install underwing nozzle (WP 0264).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
OVERWING FUEL NOZZLE MAINTENANCE (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Materials/Parts
Rag, Wiping (WP 0293, Table 1, Item 20)
Solvent, Cleaning Compound (WP 0293, Table 1, Item 26)

Equipment Condition
Overwing nozzle removed (WP 0265)
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

DISASSEMBLY

1. Place nozzle on clean work surface before starting disassembly and disconnect ground wire (Figure 1, Item 7) from nozzle handle (Figure 1, Item 1).
2. Disconnect chain on cap (Figure 1, Item 6).
3. Remove spout (Figure 1, Item 3) from nozzle handle (Figure 1, Item 1) and remove strainer (Figure 1, Item 2).
4. Loosen thumb screw (Figure 1, Item 4) and slide protector ring (Figure 1, Item 5) off spout (Figure 1, Item 3).

END OF TASK

CLEANING AND INSPECTION

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Clean strainer (Figure 1, Item 2), spout (Figure 1, Item 3), and nozzle handle (Figure 1, Item 1) with solvent and clean dry rags.

CLEANING AND INSPECTION - Continued

2. Inspect spout (Figure 1, Item 3), strainer (Figure 1, Item 2), protector ring (Figure 1, Item 5), rubber cap and chain (Figure 1, Item 6), and ground wire and connector (Figure 1, Item 7) for damage. Replace any defective parts.

END OF TASK

ASSEMBLY

1. Attach protector ring (Figure 1, Item 5) to spout (Figure 1, Item 3) and tighten thumb screw (Figure 1, Item 4).
2. Insert strainer (Figure 1, Item 2) into spout (Figure 1, Item 3) and install spout (Figure 1, Item 3) onto nozzle handle (Figure 1, Item 1).
3. Connect cap and chain (Figure 1, Item 6) to nozzle handle (Figure 1, Item 1) and ground wire (Figure 21, Item 7) to nozzle handle (Figure 1, Item 1).

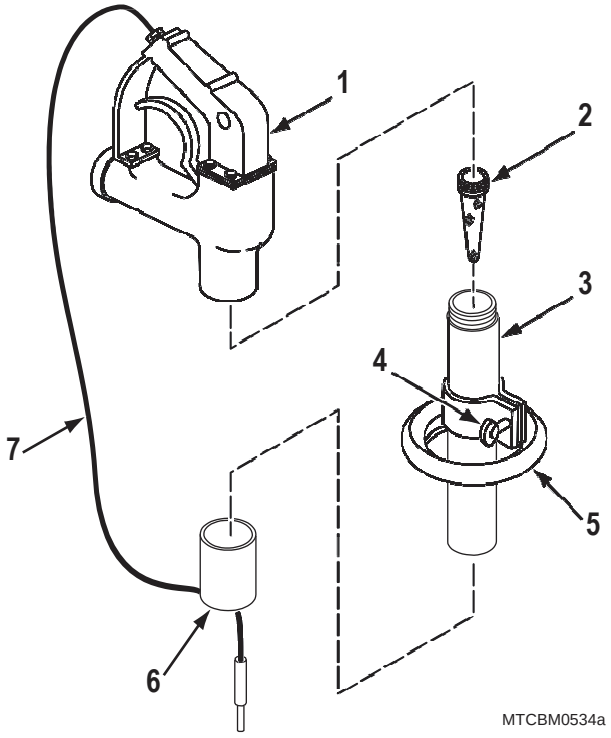

Figure 1. Overwing Nozzle Disassembly and Assembly.

END OF TASK

FOLLOW ON TASK

Install overwing nozzle (WP 0265).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FUEL NOZZLE REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Pull hose reel (Figure 1, Item 1) out far enough to access nozzle (Figure 1, Item 2) easily.
2. Remove nozzle (Figure 1, Item 2) from end of hose reel (Figure 1, Item 1).
3. If reducer (Figure 1, Item 3) is removed with nozzle (Figure 1, Item 2), remove reducer (Figure 1, Item 3) and install back on hose reel (Figure 1, Item 1).

END OF TASK

INSTALLATION

1. Install nozzle (Figure 1, Item 2) into reducer (Figure 1, Item 3) on end of hose reel (Figure 1, Item 1). Tighten securely.
2. Rewind hose reel (Figure 1, Item 1).

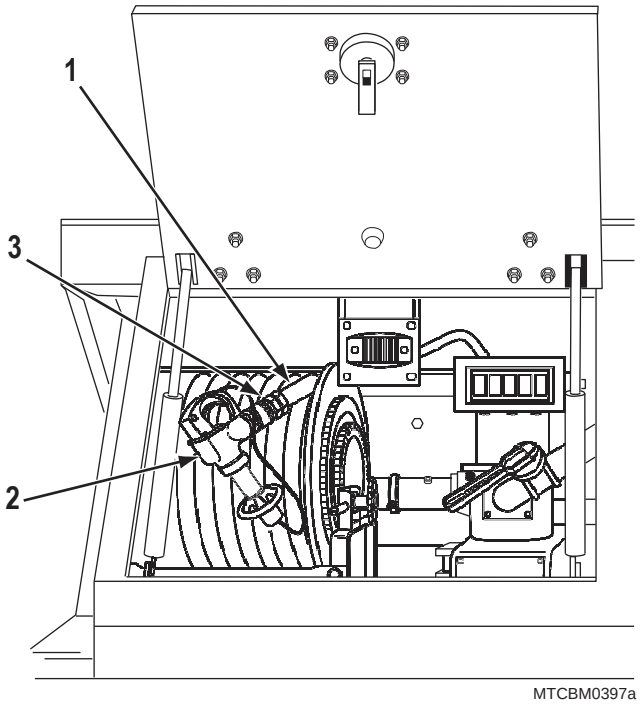

Figure 1. Fuel Nozzle Removal and Installation (M970A1 Shown).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
PRECHECK CONTROL TUBING ASSEMBLY REPLACEMENT (M967A1, M969A1, AND M969A2)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Tape, Antiseize (WP 0293, Table 1, Item 29)

Equipment Condition
Tank drained and purged (WP 0012)

Equipment Condition (cont.)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

If any precheck control tubing assembly is damaged or is not long enough to reach properly, it should be replaced.

REMOVAL

1. Disconnect precheck control tubing assembly (Figure 1, Item 1) from adapter (Figure 1, Item 5) on tee (Figure 1, Item 4) on flow control valve (Figure 1, Item 2) and remove adapter (Figure 1, Item 5) from tee (Figure 1, Item 4).
2. Disconnect tubing assembly (Figure 1, Item 1) from elbow (Figure 1, Item 12) on E valve (Figure 1, Item 11) and remove tubing assembly (Figure 1, Item 1) from semitrailer.
3. Disconnect tubing assembly (Figure 1, Item 4) from elbow (Figure 1, Item 2) on flow control valve (Figure 1, Item 3) and remove elbow (Figure 1, Item 2) from flow control valve (Figure 1, Item 3).
4. Disconnect tubing assembly (Figure 1, Item 4) from elbow (Figure 1, Item 5) on D valve (Figure 1, Item 6) and remove tubing assembly (Figure 1, Item 4) from semitrailer.
5. Disconnect tubing assembly (Figure 1, Item 9) from elbow (Figure 1, Item 10) on E valve (Figure 1, Item 11).
6. Disconnect tubing assembly (Figure 1, Item 7) from elbow (Figure 1, Item 8) on D valve (Figure 1, Item 6).
7. Remove two elbows (Figure 1, Items 10 and 12) from E valve (Figure 1, Item 11).
8. Remove two elbows (Figure 1, Items 5 and 8) from D valve (Figure 1, Item 6).

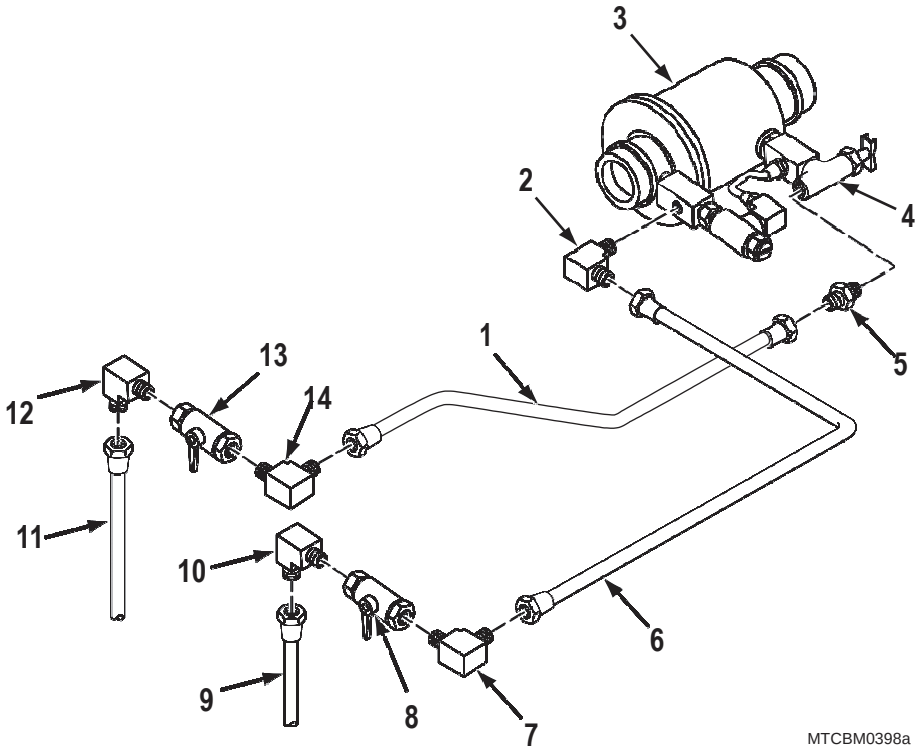

Figure 1. Precheck Control Tubing Replacement.

9. Disconnect tubing assembly (Figure 2, Item 13) from adapter (Figure 2, Item 1) on manifold (Figure 2, Item 2) and remove tubing assembly (Figure 2, Item 13) from semitrailer.
10. Disconnect tubing assembly (Figure 2, Item 4) from elbow (Figure 2, Item 7) on float valve (Figure 2, Item 6) and remove tubing assembly (Figure 2, Item 4) from semitrailer. Remove elbow (Figure 2, Item 7) from float valve (Figure 2, Item 6).
11. Remove two adapters (Figure 2, Items 1 and 3) and manifold (Figure 2, Item 2) from tubing assembly (Figure 2, Item 4).

REMOVAL - Continued

12. Disconnect tubing assembly (Figure 2, Item 12) from adapter (Figure 2, Item 11) on manifold (Figure 2, Item 10).
13. Disconnect tubing assembly (Figure 2, Item 8) from adapter (Figure 2, Item 5) on float valve (Figure 2, Item 6) and remove tubing assembly (Figure 2, Item 8) from semitrailer. Remove adapter (Figure 2, Item 5) from float valve (Figure 2, Item 6).
14. Remove two adapters (Figure 2, Items 9 and 11) and manifold (Figure 2, Item 10) from tubing assembly (Figure 2, Item 8).

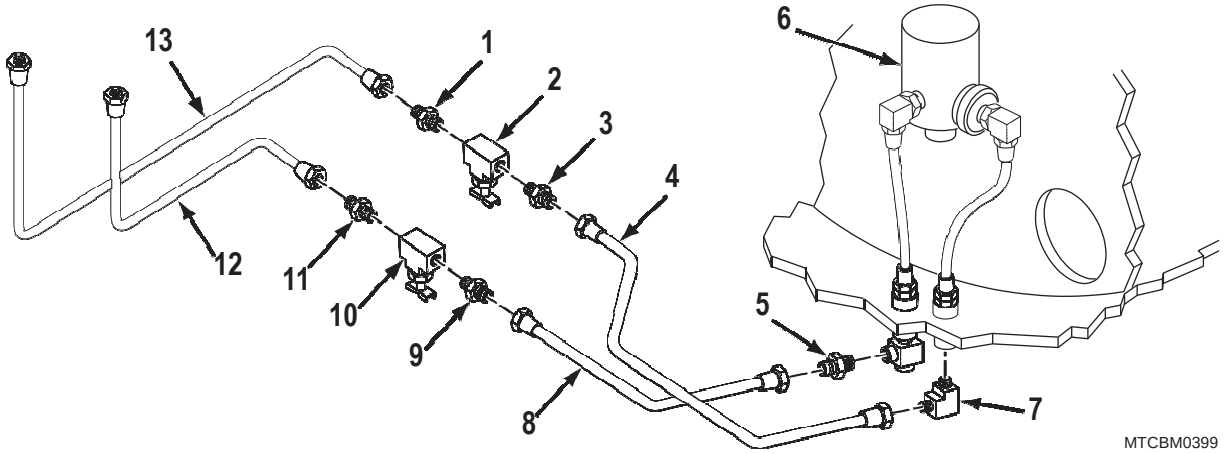

Figure 2. Precheck Control Tubing Installation.

END OF TASK

INSTALLATION

NOTE

Use antiseize tape on all male threads. Take care not to let any of the tape get into the system.

1. Install two adapters (Figure 2, Items 9 and 11) and manifold (Figure 2, Item 10) on tubing assembly (Figure 2, Item 8).
2. Install adapter (Figure 2, Item 5) on float valve (Figure 2, Item 6) and connect tubing assembly (Figure 2, Item 8) to adapter (Figure 2, Item 5).
3. Connect tubing assembly (Figure 2, Item 12) to adapter (Figure 2, Item 11) on manifold (Figure 2, Item 10).
4. Install two adapters (Figure 2, Items 1 and 3) and manifold (Figure 2, Item 2) on tubing assembly (Figure 2, Item 4).
5. Install elbow (Figure 2, Item 7) on float valve (Figure 2, Item 6) and connect tubing assembly (Figure 2, Item 4) to elbow (Figure 2, Item 7).
6. Connect tubing assembly (Figure 2, Item 13) to adapter (Figure 2, Item 1) on manifold (Figure 2, Item 2).

INSTALLATION - Continued

7. Install two elbows (Figure 3, Items 7 and 10) on D valve (Figure 3, Item 8).
8. Install two elbows (Figure 3, Items 12 and 14) on E valve (Figure 3, Item 13).
9. Connect tubing assembly (Figure 3, Item 9) to elbow (Figure 3, Item 10) on D valve (Figure 3, Item 8).
10. Connect tubing assembly (Figure 3, Item 11) to elbow (Figure 3, Item 12) on E valve (Figure 3, Item 13).
11. Connect tubing assembly (Figure 3, Item 6) to elbow (Figure 3, Item 7) on D valve (Figure 3, Item 8).
12. Install elbow (Figure 3, Item 2) on flow control valve (Figure 3, Item 3) and connect tubing assembly (Figure 3, Item 6) to elbow (Figure 3, Item 2).
13. Connect tubing assembly (Figure 3, Item 2) to elbow (Figure 3, Item 14) on E valve (Figure 3, Item 13).
14. Install adapter (Figure 3, Item 5) in tee (Figure 3, Item 4) and connect tubing assembly (Figure 3, Item 1) to tee (Figure 3, Item 4).

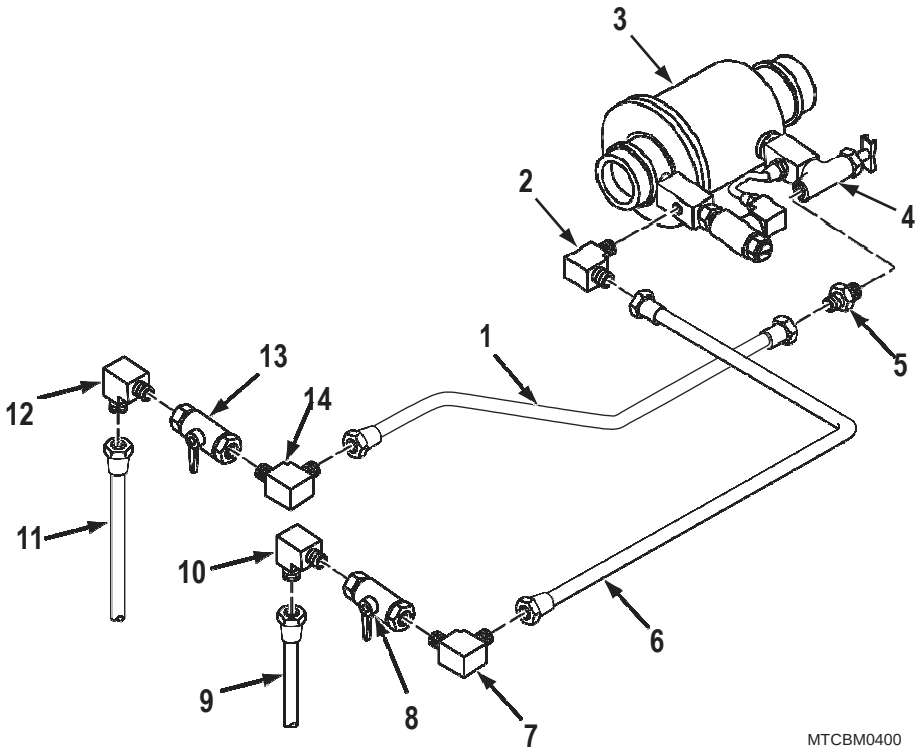

Figure 3. Precheck Control Tubing.

END OF TASK

FOLLOW ON TASK

Perform leak test (WP 0086).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
PRECHECK CONTROL TUBING ASSEMBLY REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled (WP 0007)
Tank drained and purged (WP 0012)

Materials/Parts
Tape, Antiseize (WP 0293, Table 1, Item 29)

References
WP 0086
WP 0285

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

If any precheck control tubing assembly is damaged or is not long enough to reach properly, it should be replaced.

REMOVAL

1. Disconnect tubing assembly (Figure 1, Item 19) from elbow (Figure 1, Item 20) on 4 in. control valve (Figure 1, Item 1).
2. Disconnect tubing assembly (Figure 1, Item 19) from elbow (Figure 1, Item 16) on precheck valve (Figure 1, Item 17) and remove tubing assembly (Figure 1, Item 19) from semitrailer.
3. Disconnect tubing assembly (Figure 1, Item 15) from elbow (Figure 1, Item 18) and precheck valve (Figure 1, Item 17).
4. Disconnect tubing assembly (Figure 1, Item 15) from adapter (Figure 1, Item 14) on manifold (Figure 1, Item 13) and remove tubing assembly (Figure 1, Item 15) from semitrailer.
5. Disconnect tubing assembly (Figure 1, Item 4) from adapter (Figure 1, Item 3) on tee (Figure 1, Item 2).
6. Disconnect tubing assembly (Figure 1, Item 4) from elbow (Figure 1, Item 5) on manifold (Figure 1, Item 6) and remove tubing assembly (Figure 1, Item 4) from semitrailer.
7. Disconnect tubing assembly (Figure 1, Item 11) from adapter (Figure 1, Item 12) on manifold (Figure 1, Item 13).
8. Disconnect tubing assembly (Figure 1, Item 11) from float valve adapter (Figure 1, Item 9) and remove tubing assembly (Figure 1, Item 11) from semitrailer.
9. Disconnect tubing assembly (Figure 1, Item 8) from adapter (Figure 1, Item 7) on manifold (Figure 1, Item 6).
10. Disconnect tubing assembly (Figure 1, Item 8) from float valve elbow (Figure 1, Item 10) and remove tubing assembly (Figure 1, Item 8) from semitrailer.

END OF TASK

INSPECTION

Inspect hose ends for damage. Repair or replace if damaged (WP 0285).

END OF TASK

INSTALLATION

NOTE

Use antiseize tape on all male threads. Take care not to let any of the tape get into the system.

1. Connect tubing assembly (Figure 1, Item 8) to float valve elbow (Figure 1, Item 10).
2. Connect tubing assembly (Figure 1, Item 8) to adapter (Figure 1, Item 7) on manifold (Figure 1, Item 6).
3. Connect tubing assembly (Figure 1, Item 11) to float valve adapter (Figure 1, Item 9).
4. Connect tubing assembly (Figure 1, Item 11) to adapter (Figure 1, Item 12) on manifold (Figure 1, Item 13).
5. Connect tubing assembly (Figure 1, Item 4) to elbow (Figure 1, Item 5) on manifold (Figure 1, Item 6).
6. Connect tubing assembly (Figure 1, Item 4) to adapter (Figure 1, Item 3) on tee (Figure 1, Item 2).
7. Connect tubing assembly (Figure 1, Item 15) to adapter (Figure 1, Item 14) on manifold (Figure 1, Item 13).
8. Connect tubing assembly (Figure 1, Item 15) to elbow (Figure 1, Item 18) and precheck valve (Figure 1, Item 17).
9. Connect tubing assembly (Figure 1, Item 19) to elbow (Figure 1, Item 16) on precheck valve (Figure 1, Item 17).

INSTALLATION - Continued

10. Connect tubing assembly (Figure 1, Item 19) to elbow (Figure 1, Item 20) on 4 in. control valve (Figure 1, Item 1).

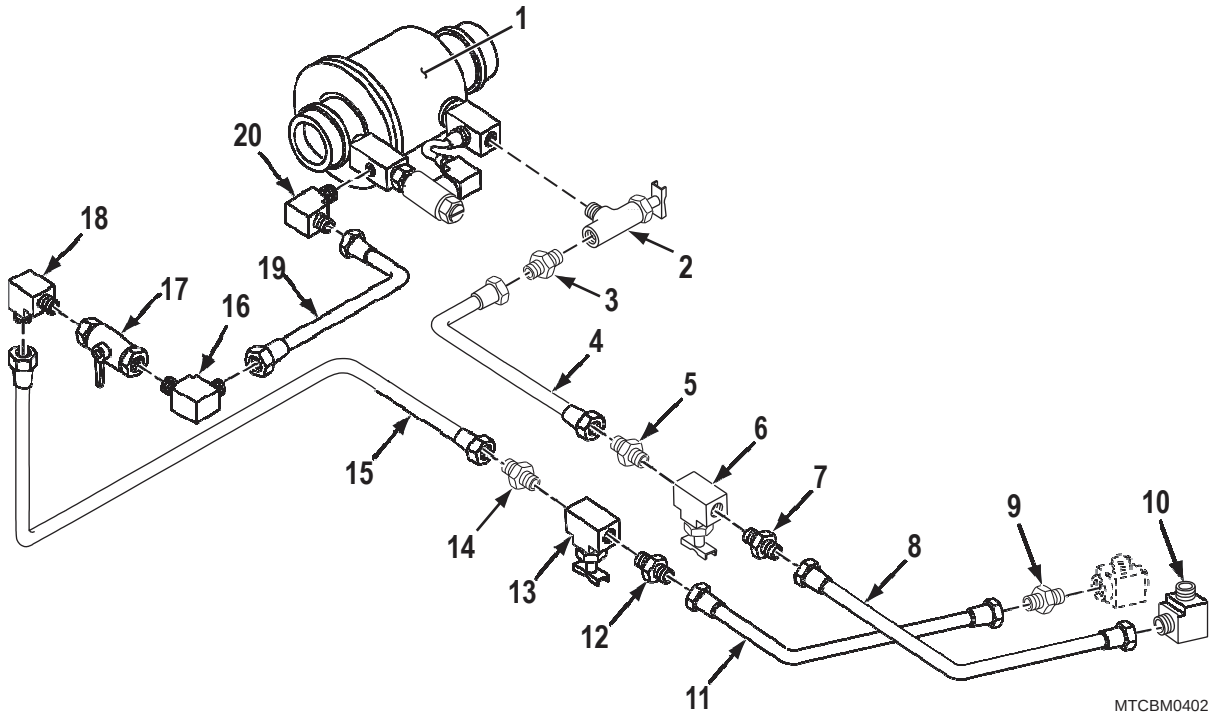

Figure 1. Precheck Control Tubing Assembly Replacement.

END OF TASK

FOLLOW ON TASK

Perform leak test (WP 0086).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ACCUMULATOR, BALL VALVE, NEEDLE VALVE, AND CABINET TUBING ASSEMBLY

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 166)
Tape, Antisieze (WP 0293, Table 1, Item 29)
Washer, Self-Locking
Qty: (2) (WP 0295, Table 1, Item 190)

References
WP 0087

References (cont.)
WP 0154
WP 0285

Equipment Condition
Semitrailer uncoupled WP 0007
Reel cabinet panel opened WP 0215

WARNING

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- Wear eye protection to prevent eye injury when working with components that could fly through the air. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

- This procedure replaces the accumulator, ball valve, needle valve and cabinet tubing. Each component can be replaced separately. Proceed to the appropriate section for desired replacement.
- For replacement of deadman release valve assembly, refer to (WP 0154).
- Note position of tee fitting and location of hoses for ease of installation.

ACCUMULATOR REMOVAL

1. Remove two hoses (Figure 1, Items 6 and 10) from fittings (Figure 1, Items 7 and 9).
2. Remove two fittings (Figure 1, Items 7 and 9) from tee fitting (Figure 1, Item 8).
3. Remove tee fitting (Figure 1, Item 8) from accumulator (Figure 1, Item 2) and bracket (Figure 1, Item 1).
4. Remove two self-locking (Figure 1, Item 5), washers (Figure 1, Item 4), screws (Figure 1, Item 3), and accumulator (Figure 1, Item 2) from bracket (Figure 1, Item 1). Discard self-locking (Figure 1, Item 5).

END OF TASK

INSPECTION

Inspect hose ends for damage (WP 0087). If hoses are damaged, replace hose assemblies (WP 0285).

END OF TASK

ACCUMULATOR INSTALLATION

NOTE

Position tee and install hoses in same location as previously noted.

1. Install accumulator (Figure 1, Item 2) to bracket (Figure 1, Item 1) with two new locknuts (Figure 1, Item 5), washers (Figure 1, Item 4), and screws (Figure 1, Item 3).
2. Apply antisieze tape to male end of two fittings (Figure 1, Items 7 and 9) and tee fitting (Figure 1, Item 8) .
3. Install tee fitting (Figure 1, Item 8) to accumulator (Figure 1, Item 2).
4. Install two fittings (Figure 1, Items 7 and 9) to tee fitting (Figure 1, Item 8).
5. Install two hoses (Figure 1, Items 6 and 10) to two fittings (Figure 1, Items 7 and 9).

ACCUMULATOR INSTALLATION - Continued

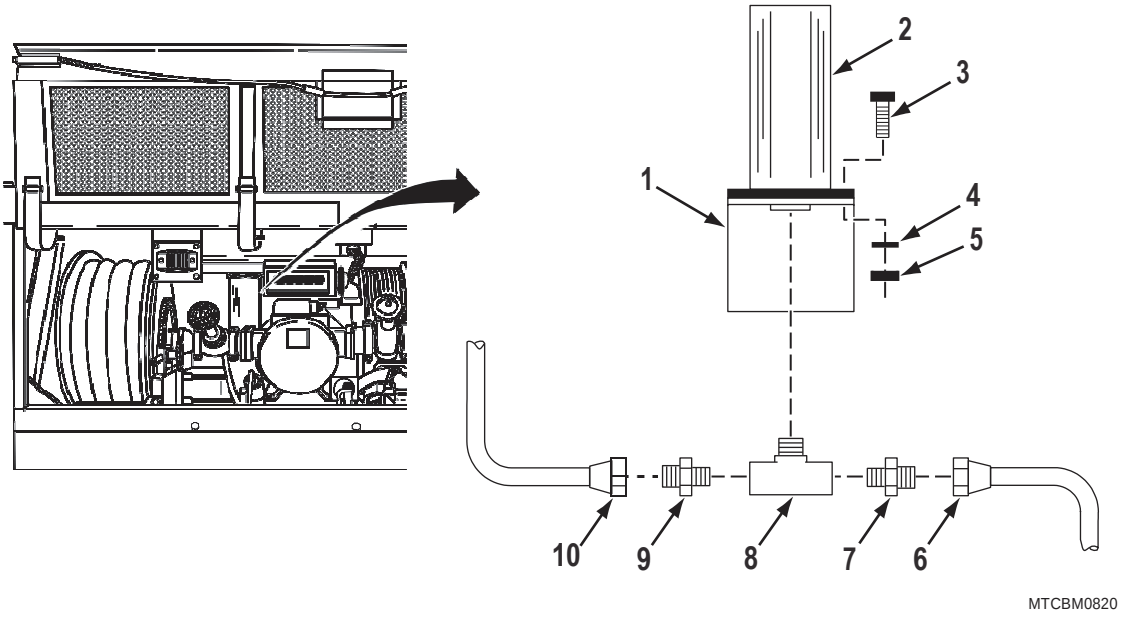

Figure 1. Accumulator and Fitting Replacement.

END OF TASK

BALL VALVE REMOVAL

1. Disconnect hose (Figure 2, Item 1) from fitting (Figure 2, Item 2).
2. Remove ball valve (Figure 2, Item 3) with two fittings (Figure 2, Items 2 and 4) from coupling (Figure 2, Item 5).
3. Remove two fittings (Figure 2, Items 2 and 4) from ball valve (Figure 2, Item 3).

END OF TASK

INSPECTION

Inspect hose ends for damage (WP 0087). If hoses are damaged, replace hose assemblies (WP 0285).

END OF TASK

BALL VALVE INSTALLATION

1. Apply antisieze tape to male end of two fittings (Figure 2, Items 2 and 4).
2. Install two fittings (Figure 2, Items 2 and 4) to ball valve (Figure 2, Item 3).
3. Install ball valve (Figure 2, Item 3) with fittings (Figure 2, Items 2 and 4) to coupling (Figure 2, Item 5).
4. Install hose (Figure 2, Item 1) to fitting (Figure 2, Item 2).

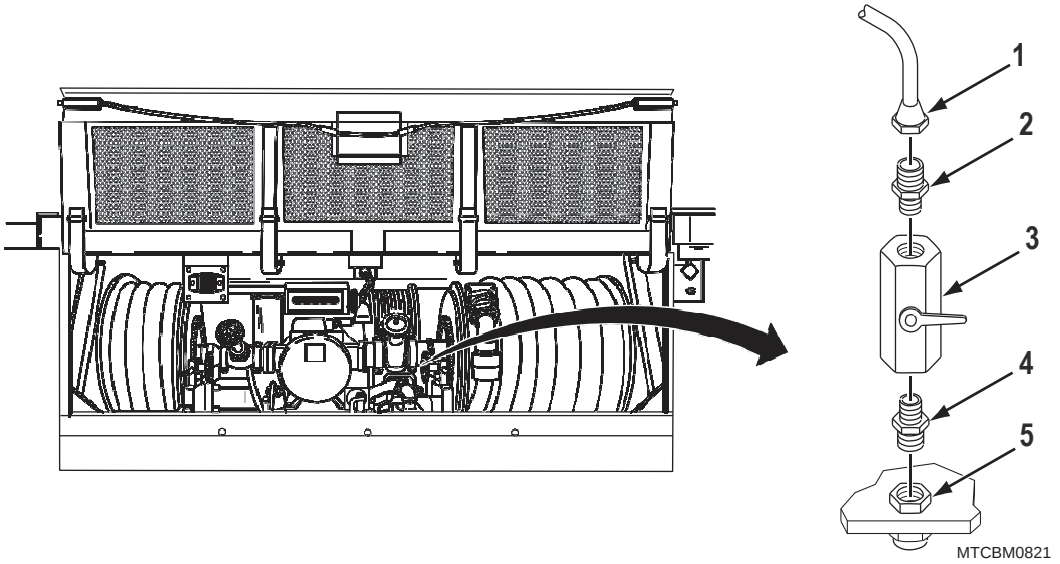

Figure 2. Ball Valve and Fitting Replacement.

END OF TASK

NEEDLE VALVE REMOVAL

1. Disconnect two hoses (Figure 3, Items 5 and 6) from tee fitting (Figure 3, Item 4).
2. Remove needle valve (Figure 3, Item 3) with tee fitting (Figure 3, Item 4) and fitting (Figure 3, Item 2) from coupling (Figure 3, Item 1).
3. Remove tee fitting (Figure 3, Item 4) and fitting (Figure 3, Item 2) from needle valve (Figure 3, Item 3).

END OF TASK

INSPECTION

Inspect hose ends for damage (WP 0087). If hoses are damaged, replace hose assemblies (WP 0285).

END OF TASK

NEEDLE VALVE INSTALLATION

1. Apply antisieze tape to male end of fitting (Figure 3, Item 2) and tee fitting (Figure 3, Item 4).
2. Install fitting (Figure 3, Item 2) and tee fitting (Figure 3, Item 4) to needle valve (Figure 3, Item 3).
3. Install needle valve (Figure 3, Item 3) with fitting (Figure 3, Item 2) and tee fitting (Figure 3, Item 4) to coupling (Figure 3, Item 1).
4. Install hoses (Figure 3, Items 5 and 6) to tee fitting (Figure 3, Item 4).

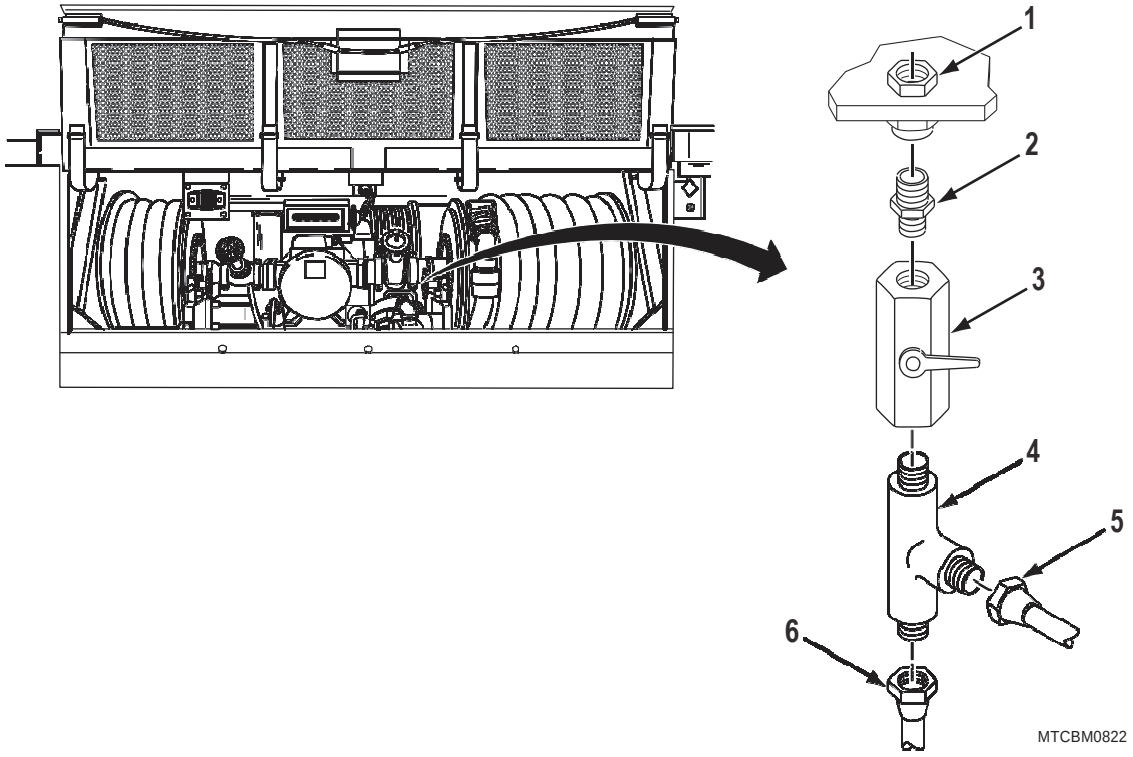

Figure 3. Needle Valve and Fitting Replacement.

END OF TASK

CABINET COUPLING REMOVAL

1. Perform BALL VALVE REMOVAL.
2. Perform NEEDLE VALVE REMOVAL.
3. Remove jamnut (Figure 4, Item 4), lockwasher (Figure 4, Item 3), and coupling (Figure 4, Item 1) from bracket (Figure 4, Item 2). Discard lockwasher (Figure 4, Item 3).

END OF TASK

CABINET COUPLING INSTALLATION

1. Install new lockwasher (Figure 4, Item 3), jamnut (Figure 4, Item 4), and coupling (Figure 4, Item 1) to bracket (Figure 4, Item 2).
2. Perform NEEDLE VALVE INSTALLATION.
3. Perform BALL VALVE INSTALLATION.

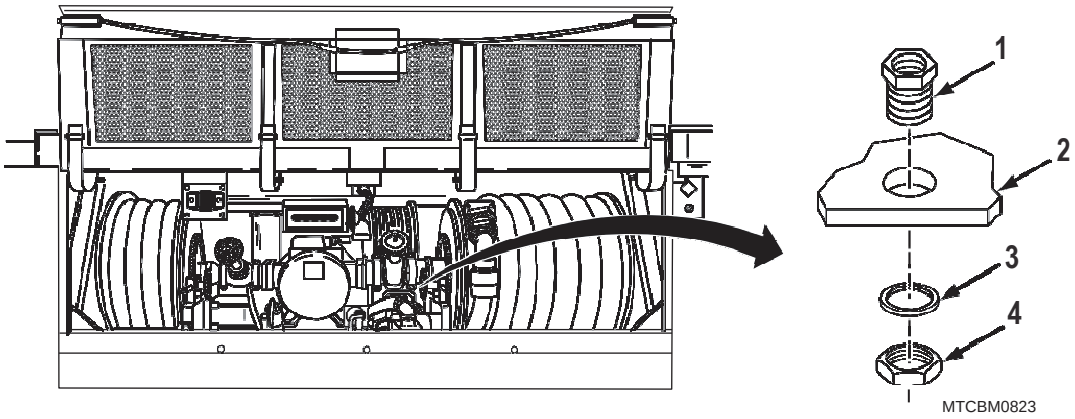

Figure 4. Coupling Replacement.

END OF TASK

COUPLING AND TUBE REMOVAL

1. Remove hose (Figure 5, Item 3) from fitting (Figure 5, Item 2).
2. Remove fitting (Figure 5, Item 2) from tube (Figure 5, Item 1).
3. Remove tube (Figure 5, Item 1) from 2-1/2 in. hose reel.

END OF TASK

INSPECTION

Inspect hose ends for damage (WP 0087). If hoses are damaged, replace hose assemblies (WP 0285).

END OF TASK

COUPLING AND TUBE INSTALLATION

1. Apply antisieze tape to male end of coupling (Figure 5, Item 2) and tube (Figure 3, Item 1).
2. Install tube (Figure 5, Item 1) to 2-1/2 in. hose reel.
3. Install coupling (Figure 5, Item 2) to tube (Figure 5, Item 1).
4. Install hose (Figure 5, Item 3) to coupling (Figure 5, Item 2).

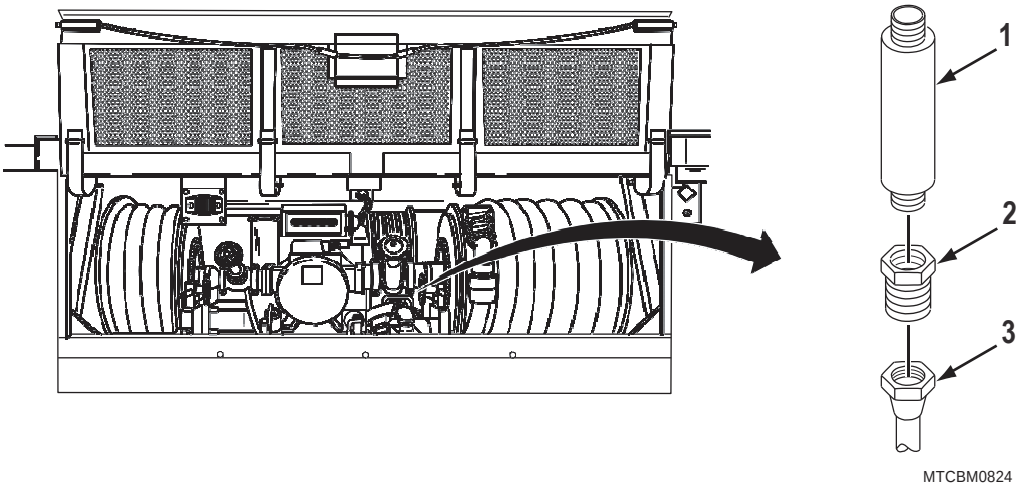

Figure 5. Coupling and Tube Replacement.

END OF TASK

FOLLOW ON TASK

Close reel cabinet panel (WP 0215).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FLOAT VALVE REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Washer, Lock
Qty: (4) (WP 0295, Table 1, Item 195)

Equipment Condition
Semitrailer bonded and grounded (WP 0008)

Equipment Condition (cont.)
Semitrailer uncoupled (WP 0007)
Tank drained and purged (WP 0012)

WARNING

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- DO NOT climb into interior of tank until it has been completely drained and purged and a combustible gas indicator indicates that it is safe. Adequate forced air ventilation or a self-contained breathing apparatus must be used. Any person entering tank must have an attached lifeline. An observer must be stationed at the manhole opening so that assistance may be summoned in the event of an emergency. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

NOTE

Float valve is located inside semitrailer tank. It can only be removed from inside the tank.

1. Disconnect tube (Figure 1, Item 7) with elbow (Figure 1, Item 8) and bushing (Figure 1, Item 9) from float valve (Figure 1, Item 1).
2. Disconnect tube (Figure 1, Item 6) with elbow (Figure 1, Item 5) and bushing (Figure 1, Item 4) from float valve (Figure 1, Item 1).
3. Remove four bolts (Figure 1, Item 2), lockwashers (Figure 1, Item 3), and float valve (Figure 1, Item 1) from semitrailer. Discard lockwashers (Figure 1, Item 3).

END OF TASK

INSTALLATION

1. Install float valve (Figure 1, Item 1) on semitrailer with four bolts (Figure 1, Item 2) and new lockwashers (Figure 1, Item 3).
2. Install tube (Figure 1, Item 6) with elbow (Figure 1, Item 5) and bushing (Figure 1, Item 4) on float valve (Figure 1, Item 1).
3. Install tube (Figure 1, Item 7) with elbow (Figure 1, Item 8) and bushing (Figure 1, Item 9) on float valve (Figure 1, Item 1).

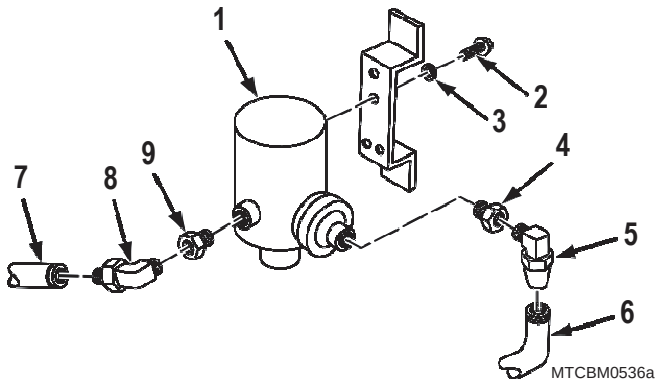

Figure 1. Float Valve Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
EMERGENCY VALVE A MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)
Stand, Jack (WP 0294, Table 1, Item 18)

Materials/Parts
O-Ring (WP 0295, Table 1, Item 75)
Preformed Packing

Materials/Parts (cont.)
Qty: (2) (WP 0295, Table 1, Item 76)
Rag, Wiping (WP 0293, Table 1, Item 20)
Seal (WP 0295, Table 1, Item 16)
Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)

Equipment Condition
Semitrailer bonded and grounded WP 0008
Semitrailer uncoupled WP 0007
Tank drained and purged (WP 0012)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Loosen two nuts (Figure 1, Item 9) on emergency valve lever U-bolt (Figure 1, Item 7) and disconnect emergency valve cable (Figure 1, Item 8) from emergency valve (Figure 1, Item 5).

CAUTION

To avoid equipment damage, support large outlet tube with suitable support before removal. Failure to comply may result in damage to, or destruction of, equipment or mission.

2. Remove two bolts (Figure 1, Item 1), nuts (Figure 1, Item 12), seal (Figure 1, Item 11), and coupling (Figure 1, Item 2) from emergency valve (Figure 1, Item 5) and outlet pipe (Figure 1, Item 13). Discard seal (Figure 1, Item 11).
3. Remove eight nuts (Figure 1, Item 6), emergency valve (Figure 1, Item 5), push rod (Figure 1, Item 4), and adapter (Figure 1, Item 3) from tank sump (Figure 1, Item 10).

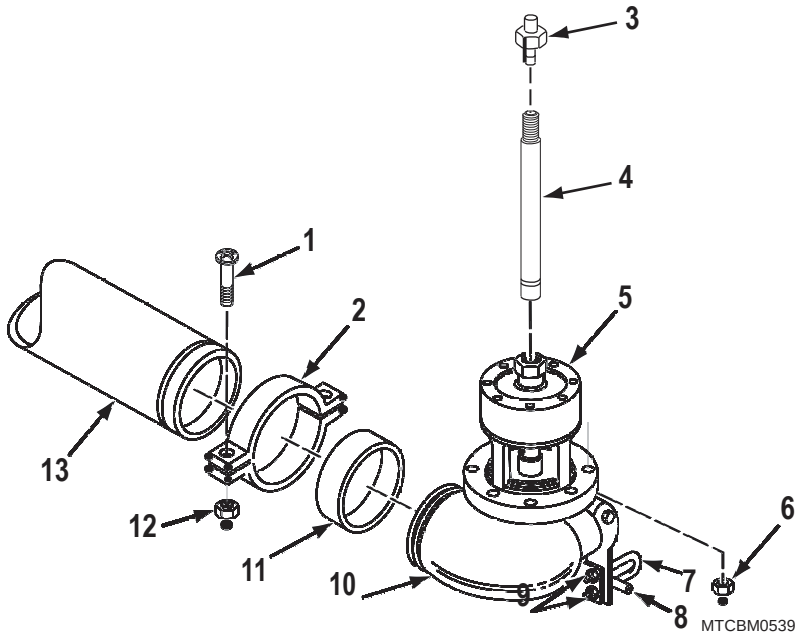

Figure 1. Emergency Valve A Removal.

END OF TASK

DISASSEMBLY

1. Loosen nut (Figure 2, Item 14) and screw (Figure 2, Item 12) and remove lever (Figure 2, Item 13) from stem (Figure 2, Item 15).
2. Remove stuffing box nut (Figure 2, Item 10), O-ring (Figure 2, Item 11), and two preformed packings (Figure 2, Item 9) from operating stem (Figure 2, Item 15). Discard O-ring (Figure 2, Item 11) and preformed packings (Figure 2, Item 9).
3. Remove stem (Figure 2, Item 15) and cam (Figure 2, Item 16) from body (Figure 2, Item 7).
4. Loosen setscrew (Figure 2, Item 21) and remove adapter (Figure 2, Item 20) from bonnet (Figure 2, Item 19).

DISASSEMBLY - Continued

5. Loosen three setscrews (Figure 2, Item 8) and remove bonnet (Figure 2, Item 19) from body (Figure 2, Item 7).
6. Remove spring (Figure 2, Item 17) and stem (Figure 2, Item 18) from bonnet (Figure 2, Item 19).
7. Remove nut (Figure 2, Item 6), washer (Figure 2, Item 5), retaining plate (Figure 2, Item 4), plunger disc (Figure 2, Item 3), disc holder (Figure 2, Item 2), and screen (Figure 2, Item 1) from stem (Figure 2, Item 18).

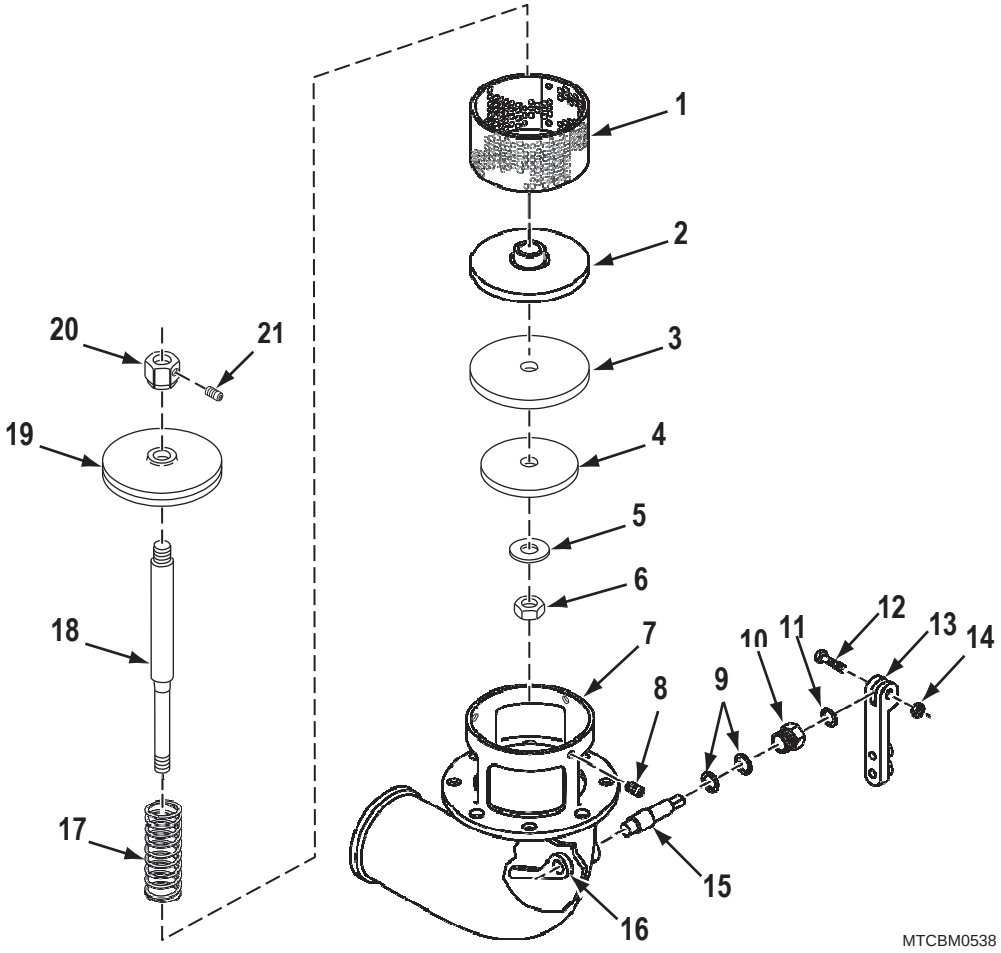

Figure 2. Emergency Valve A Disassembly.

END OF TASK

CLEANING AND INSPECTION

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Clean emergency valve and all metal parts with solvent and clean dry rag. Dry thoroughly.
2. Inspect emergency valve for damage and wear. Replace emergency valve if damaged.

END OF TASK

ASSEMBLY

1. Install cam (Figure 3, Item 15) and stem (Figure 3, Item 14) in body (Figure 3, Item 6).
2. Install new O-ring (Figure 3, Item 10), two new preformed packings (Figure 3, Item 8), and stuffing box nut (Figure 3, Item 9) on stem (Figure 3, Item 14).
3. Install lever (Figure 3, Item 12) on stem (Figure 3, Item 14) and tighten screw (Figure 3, Item 11) and nut (Figure 3, Item 13).
4. Install disc holder (Figure 3, Item 1), plunger disc (Figure 3, Item 2), retaining plate (Figure 3, Item 3), washer (Figure 3, Item 4), and nut (Figure 3, Item 5) on stem (Figure 3, Item 17).
5. Install spring (Figure 3, Item 16) on stem (Figure 3, Item 17).

ASSEMBLY - Continued

6. Install bonnet (Figure 3, Item 18) on body (Figure 3, Item 6) with three screws (Figure 3, Item 7).
7. Install adapter (Figure 3, Item 19) on bonnet (Figure 3, Item 18) and tighten setscrew (Figure 3, Item 20).

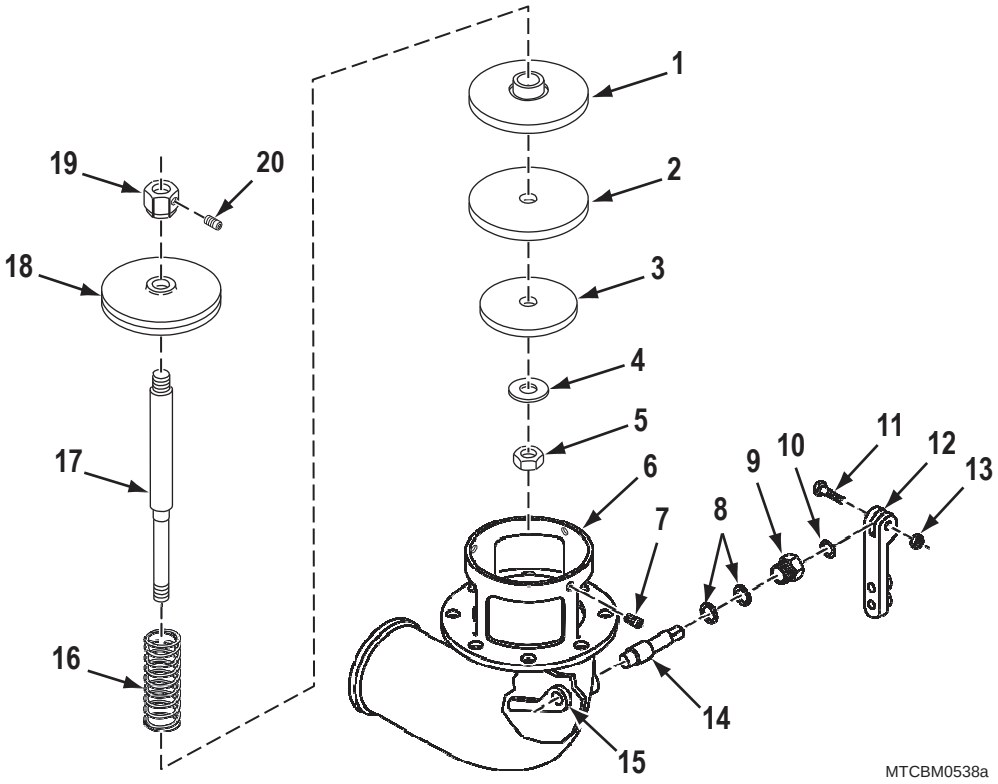

Figure 3. Emergency Valve A Assembly.

END OF TASK

INSTALLATION

1. Install emergency valve (Figure 4, Item 3), push rod (Figure 4, Item 2), and adapter (Figure 4, Item 1) on tank sump (Figure 4, Item 8) with eight nuts (Figure 4, Item 5).
2. Install new gasket (Figure 4, Item 9) and coupling (Figure 4, Item 13) on emergency valve (Figure 4, Item 3) and outlet pipe (Figure 4, Item 11) with two bolts (Figure 4, Item 12) and nuts (Figure 4, Item 10).
3. Install emergency valve cable (Figure 4, Item 6) on emergency valve (Figure 4, Item 3) and tighten two nuts (Figure 4, Item 7) on emergency valve lever U-bolt (Figure 4, Item 4).

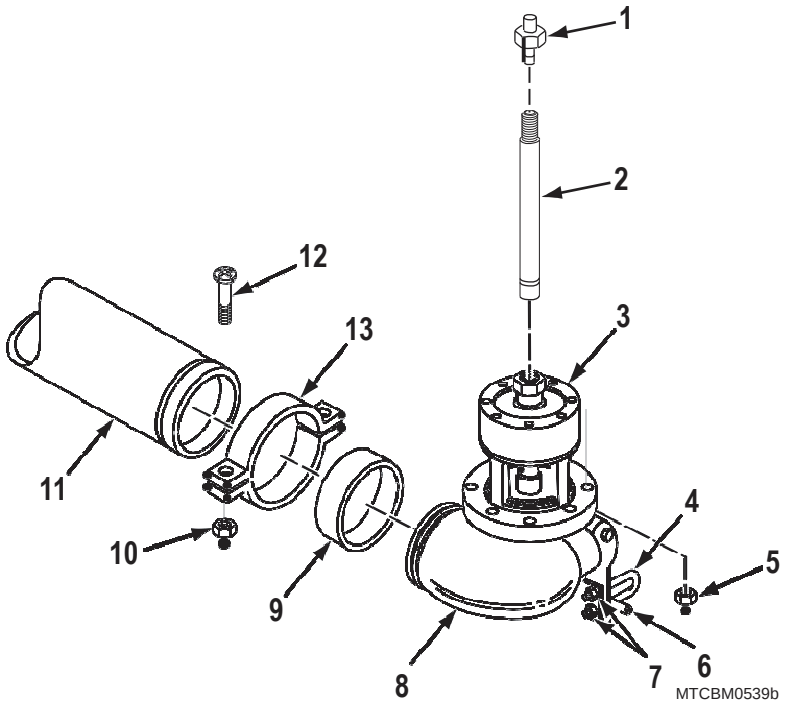

Figure 4. Emergency Valve A Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
B, C, AND F VALVE ASSEMBLY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Gasket Qty: (2) (WP 0295, Table 1, Item 106)
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (16) (WP 0295, Table 1, Item 78)

Equipment Condition
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Use this task to replace B, C, and F valve assembly. F valve assembly is shown.

REMOVAL

Remove 16 self-locking nuts (Figure 1, Item 1), washers (Figure 1, Item 2), screws (Figure 1, Item 3), two gaskets (Figure 1, Item 5), and F valve (Figure 1, Item 6) from piping (Figure 1, Item 4). Discard self-locking nuts (Figure 1, Item 1) and gaskets (Figure 1, Item 5).

END OF TASK

INSTALLATION

Install F valve (Figure 1, Item 6) and two new gaskets (Figure 1, Item 5) on piping (Figure 1, Item 4) with 16 screws (Figure 1, Item 3), new self-locking nuts (Figure 1, Item 1) and washers (Figure 1, Item 2).

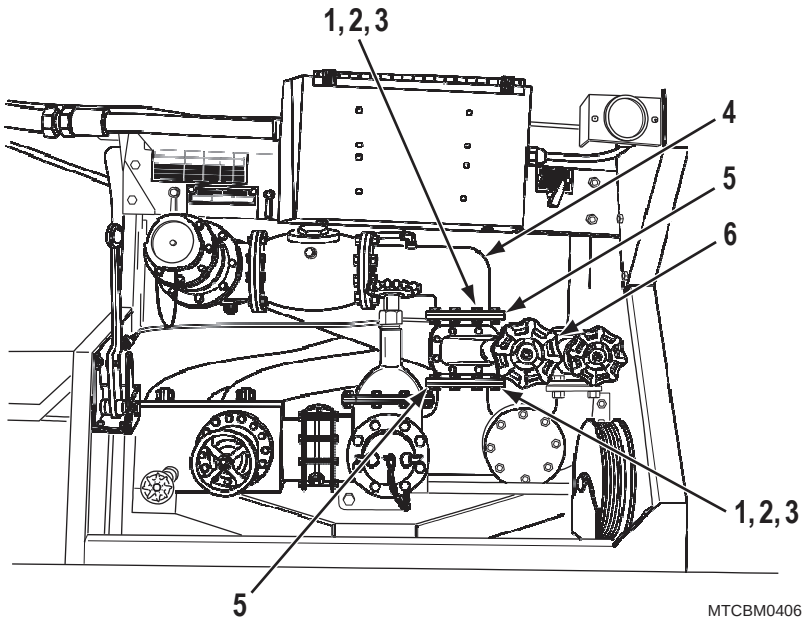

Figure 1. B, C, and F Valve Assembly Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
B, C, AND F VALVE ASSEMBLY HANDWHEEL REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Equipment Condition
Semitrailer uncoupled WP 0007

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Use this task to replace handwheel on B, C, and F valve assembly. F valve is shown.

REMOVAL

1. Loosen nut (Figure 1, Item 2) and turn handwheel (Figure 1, Item 1) counterclockwise.
2. Remove nut (Figure 1, Item 2) and handwheel (Figure 1, Item 1) from F valve assembly (Figure 1, Item 3).

END OF TASK

INSTALLATION

1. Install nut (Figure 1, Item 2) and handwheel (Figure 1, Item 1) on F valve assembly (Figure 1, Item 3).
2. Tighten nut (Figure 1, Item 2) and turn handwheel (Figure 1, Item 1) clockwise.

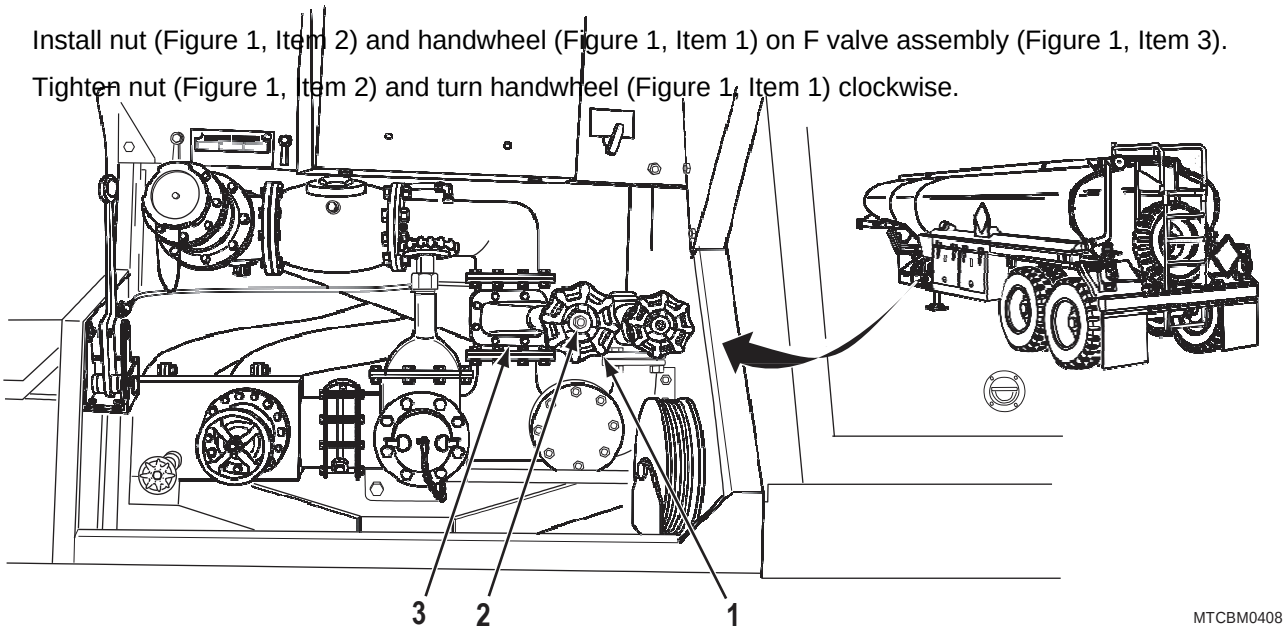

Figure 1. Valve Assembly Handwheel Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
B, C, AND F VALVE ASSEMBLY MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Materials/Parts
Gasket (WP 0295, Table 1, Item 106)
Packing (WP 0295, Table 1, Item 99)
Rag, Wiping (WP 0293, Table 1, Item 20)
Solvent, Cleaning Compound

Materials/Parts (cont.)
(WP 0293, Table 1, Item 25)
Washer, Lock
Qty: (8) (WP 0295, Table 1, Item 73)

Equipment Condition
B, C, and F valve assembly removed WP 0273
Semitrailer bonded and grounded WP 0008
Semitrailer uncoupled (WP 0007)

WARNING

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CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

Use this task to repair the B, C, and F valve assembly. The F valve assembly is shown.

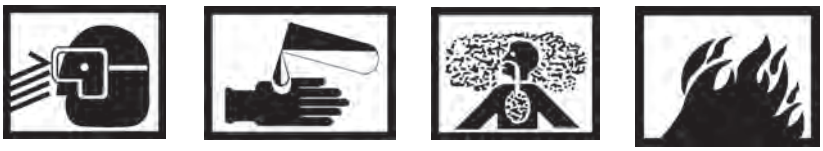
DISASSEMBLY

1. Remove eight screws (Figure 1, Item 10), lockwashers (Figure 1, Item 8), nuts (Figure 1, Item 9), gasket (Figure 1, Item 6), and bonnet (Figure 1, Item 11) from valve body (Figure 1, Item 7). Discard lockwashers (Figure 1, Item 8) and gasket (Figure 1, Item 6).
2. Loosen packing nut (Figure 1, Item 2) and turn handwheel (Figure 1, Item 1) counterclockwise. Remove nut (Figure 1, Item 15), handwheel (Figure 1, Item 1), packing nut (Figure 1, Item 2), spring (Figure 1, Item 14), packing retainer (Figure 1, Item 13), and packing (Figure 1, Item 12) from bonnet (Figure 1, Item 11). Discard packing (Figure 1, Item 12).
3. Remove stem (Figure 1, Item 3), pull nut (Figure 1, Item 4), and disc assembly (Figure 1, Item 5) from valve body (Figure 1, Item 7).

END OF TASK

CLEANING AND INSPECTION

WARNING



- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Clean all metal parts with solvent and clean dry rags.

CLEANING AND INSPECTION - Continued

2. Inspect metal parts for cracks, scoring, and pitting. Replace any damaged parts.

END OF TASK

ASSEMBLY

1. Install stem (Figure 1, Item 3), pull nut (Figure 1, Item 4), and disc assembly (Figure 1, Item 5) in valve body (Figure 1, Item 7).
2. Install nut (Figure 1, Item 15), handwheel (Figure 1, Item 1), packing nut (Figure 1, Item 2), spring (Figure 1, Item 14), packing retainer (Figure 1, Item 13), and new packing (Figure 1, Item 12) on bonnet (Figure 1, Item 11). Tighten packing nut (Figure 1, Item 2) and turn handwheel (Figure 1, Item 1) clockwise.
3. Install eight screws (Figure 1, Item 10), new lockwashers (Figure 1, Item 8), nuts (Figure 1, Item 9), new gasket (Figure 1, Item 6), and bonnet (Figure 1, Item 11) on valve body (Figure 1, Item 7).

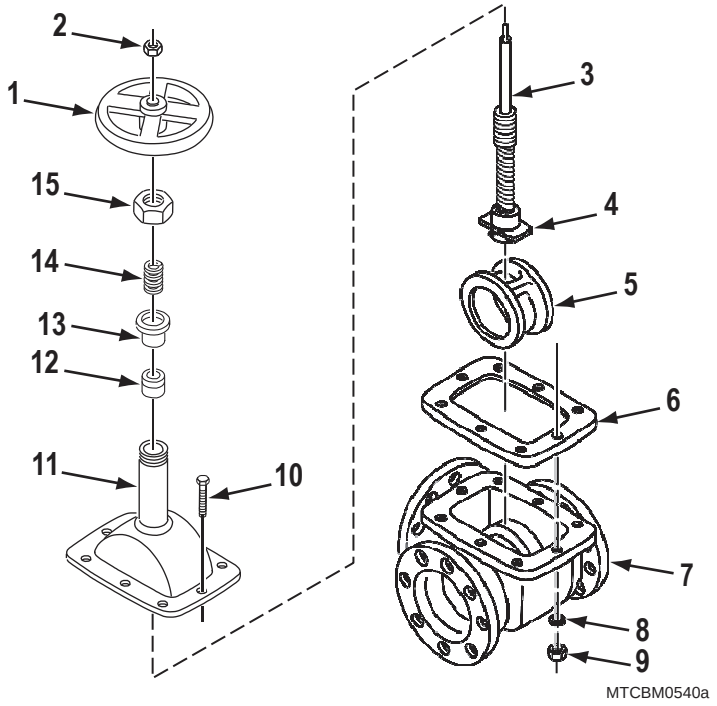


Figure 1. B, C, and F Valve Assemblies Maintenance.

END OF TASK

FOLLOW ON TASK

Install B, C, and F valve assembly (WP 0273).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
RECIRCULATION ADAPTER ASSEMBLY REPLACEMENT (M970A1)

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Gasket (WP 0295, Table 1, Item 14)
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (8) (WP 0295, Table 1, Item 165)
O-Ring (WP 0295, Table 1, Item 184)

Equipment Condition
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

REMOVAL

1. Remove filler cap (Figure 1, Item 8) from pressure adapter (Figure 1, Item 10).
2. Remove two retaining pins (Figure 1, Item 5), conduit (Figure 1, Item 6), and chain (Figure 1, Item 7) from filler cap (Figure 1, Item 8) and pressure adapter (Figure 1, Item 10).
3. Remove six screws (Figure 1, Item 9), pressure adapter (Figure 1, Item 10), and O-ring (Figure 1, Item 4) from brake drum adapter (Figure 1, Item 1). Discard O-ring (Figure 1, Item 4).
4. Remove eight self-locking nuts (Figure 1, Item 11), brake drum adapter (Figure 1, Item 1) and gasket (Figure 1, Item 2) from housing (Figure 1, Item 3). Discard gasket (Figure 1, Item 2) and self-locking nuts (Figure 1, Item 11).

END OF TASK

INSTALLATION

1. Install brake drum adapter (Figure 1, Item 1) and new gasket (Figure 1, Item 2) on housing (Figure 1, Item 3) with eight new self-locking nuts (Figure 1, Item 11).
2. Install pressure adapter (Figure 1, Item 10) and new O-ring (Figure 1, Item 4) on brake drum adapter (Figure 1, Item 1) with six screws (Figure 1, Item 9).
3. Install chain (Figure 1, Item 7), conduit (Figure 1, Item 6), and two retaining pins (Figure 1, Item 5) on pressure adapter (Figure 1, Item 10) and filler cap (Figure 1, Item 8).
4. Install filler cap (Figure 1, Item 8) on pressure adapter (Figure 1, Item 10).

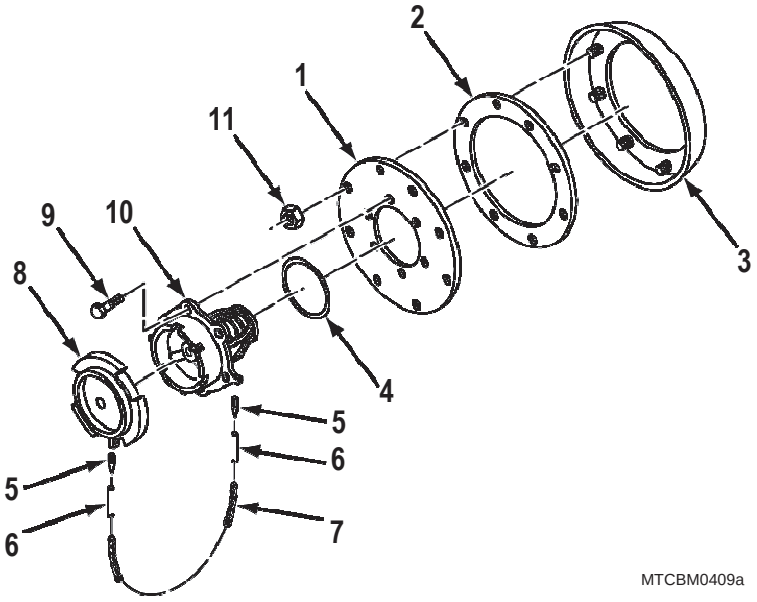


Figure 1. Recirculation Adapter Assembly Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CHECK VALVE ASSEMBLY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)
Wrench, Torque (WP 0294, Table 1, Item 25)

Materials/Parts
Gasket Qty: (3) (WP 0295, Table 1, Item 15)

Materials/Parts (cont.)
Gasket Qty: (2) (WP 0295, Table 1, Item 21)
Seal (WP 0295, Table 1, Item 16)
Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)

Equipment Condition
Semitrailer uncoupled (WP 0007)

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

After removal, regardless of model, clean all parts and inspect for damage. Replace damaged parts.

ANGLE VALVE AND CHECK VALVE REMOVAL (M970A1)

1. Remove two screws (Figure 1, Item 3), nuts (Figure 1, Item 4), coupling (Figure 1, Item 5), and seal (Figure 1, Item 2) from nipple (Figure 1, Item 8). Discard seal (Figure 1, Item 2).
2. Remove four screws (Figure 1, Item 18), 12 washers (Figure 1, Item 11), four nuts (Figure 1, Item 12), gasket (Figure 1, Item 14), angle valve (Figure 1, Item 15), and check valve (Figure 1, Item 20) from manifold (Figure 1, Item 13). Discard gasket (Figure 1, Item 14).
3. Remove four screws (Figure 1, Item 16), 12 washers (Figure 1, Item 17), four nuts (Figure 1, Item 1), and gasket (Figure 1, Item 19) and separate check valve (Figure 1, Item 20) from angle valve (Figure 1, Item 15). Discard gasket (Figure 1, Item 19).
4. Remove four screws (Figure 2, Item 6), 12 washers (Figure 2, Item 7), four nuts (Figure 2, Item 10), gasket (Figure 2, Item 9), and separate nipple (Figure 2, Item 8) from check valve (Figure 2, Item 20). Discard gasket (Figure 2, Item 9).

END OF TASK

ANGLE VALVE AND CHECK VALVE INSTALLATION (M970A1)

1. Install nipple (Figure 1, Item 8) and new gasket (Figure 1, Item 9) on check valve (Figure 1, Item 20) with four screws (Figure 1, Item 6), 12 washers (Figure 1, Item 7) and four nuts (Figure 1, Item 10).
2. Install angle valve (Figure 1, Item 15) and new gasket (Figure 1, Item 19) on check valve (Figure 1, Item 20) with four screws (Figure 1, Item 16), 12 washers (Figure 1, Item 17), and four nuts (Figure 1, Item 1).
3. Install angle valve (Figure 1, Item 15), check valve (Figure 1, Item 20), and new gasket (Figure 1, Item 14) on manifold (Figure 1, Item 13) with four screws (Figure 1, Item 18), 12 washers (Figure 1, Item 11), and four nuts (Figure 1, Item 12).
4. Install coupling (Figure 1, Item 5) and new seal (Figure 1, Item 2) with two screws (Figure 1, Item 3) and nuts (Figure 1, Item 4). Torque nuts (Figure 1, Item 4) to 57-63 lb ft (77.3-85.4 N·m).
5. Torque screws (Figure 1, Item 18) to 25-35 lb ft (33.9-47.5 N·m).

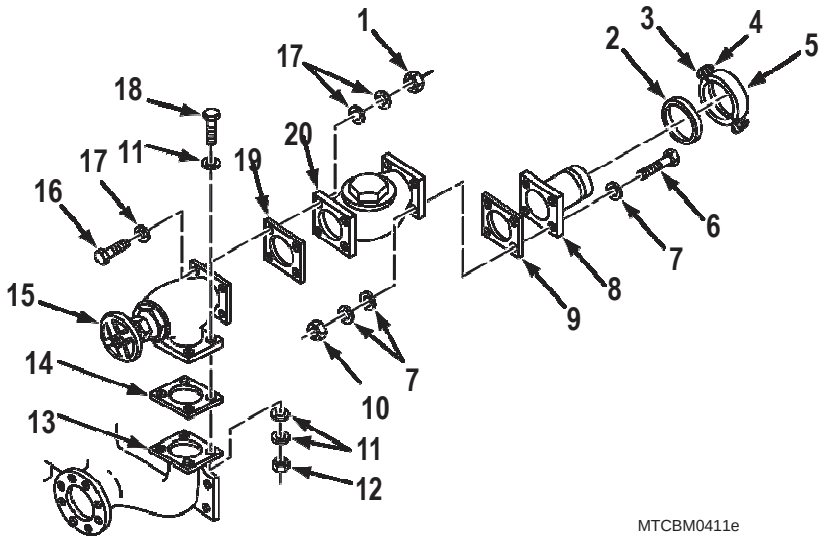


Figure 1. Angle/Check Valve Replacement (M970A1).

END OF TASK

CHECK VALVE REMOVAL (M967A1, M969A1, AND M969A2)

1. Remove eight screws (Figure 2, Item 1), washers (Figure 2, Item 3), nuts (Figure 2, Item 4), check valve (Figure 2, Item 10), and gasket (Figure 2, Item 11) from control valve (Figure 2, Item 2). Discard gasket (Figure 2, Item 11).
2. Remove eight screws (Figure 2, Item 7), washers (Figure 2, Item 6), nuts (Figure 2, Item 5), check valve (Figure 2, Item 10), and gasket (Figure 2, Item 9) from manifold (Figure 2, Item 8). Discard gasket (Figure 2, Item 9).

END OF TASK

CHECK VALVE INSTALLATION (M967A1, M969A1, AND M969A2)

1. Install check valve (Figure 2, Item 10) and new gasket (Figure 2, Item 9) on manifold (Figure 2, Item 8) with eight screws (Figure 2, Item 7), washers (Figure 2, Item 6), and nuts (Figure 2, Item 5).
2. Install check valve (Figure 2, Item 10) and new gasket (Figure 2, Item 11) on control valve (Figure 2, Item 2) with eight screws (Figure 2, Item 1), washers (Figure 2, Item 3), and nuts (Figure 2, Item 4).

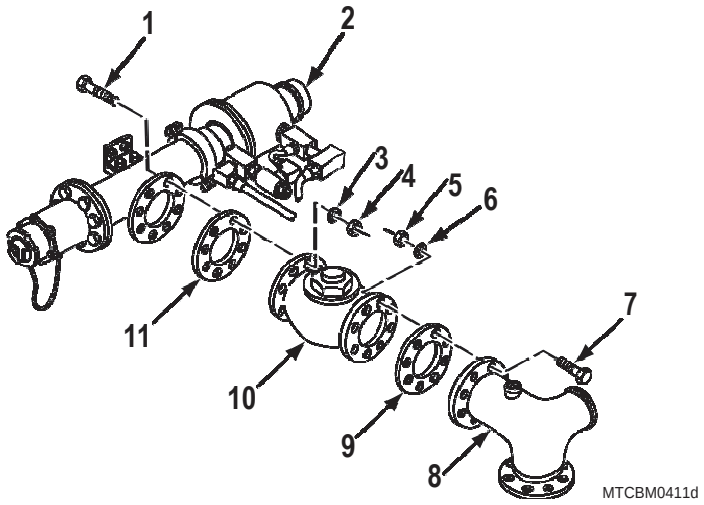


Figure 2. Check Valve Replacement (M967A1, M969A1, and M969A2).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CHECK VALVE ASSEMBLY MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Materials/Parts
O-Ring (WP 0295, Table 1, Item 101)
O-Ring (WP 0295, Table 1, Item 104)
Rag, Wiping (WP 0293, Table 1, Item 20)
Solvent, Cleaning Compound

Materials/Parts (cont.)
(WP 0293, Table 1, Item 25)

References
WP 0277

Equipment Condition
Check valve assembly removed (WP 0277)
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

DISASSEMBLY

1. Remove retaining ring (Figure 1, Item 1), cap (Figure 1, Item 2) and O-ring (Figure 1, Item 3) from check valve (Figure 1, Item 7). Discard O-ring (Figure 1, Item 3).
2. Remove two plugs (Figure 1, Item 6), lever bushing (Figure 1, Item 11), pin (Figure 1, Item 12), disc (Figure 1, Item 4), and O-ring (Figure 1, Item 5) from check valve (Figure 1, Item 7). Discard O-ring (Figure 1, Item 5).
3. Remove lever (Figure 1, Item 8), washer (Figure 1, Item 9), and retaining ring (Figure 1, Item 10) from disc (Figure 1, Item 4).

END OF TASK

CLEANING AND INSPECTION

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

1. Clean all metal parts with solvent and clean dry rags.
2. Inspect metal parts for cracks, scoring and pitting. Replace any damaged parts.

CLEANING AND INSPECTION - Continued

3. Inspect O-ring (Figure 1, Item 5) and disc (Figure 1, Item 4) for damage. If they are damaged, check valve assembly must be replaced.

END OF TASK

ASSEMBLY

1. Install lever (Figure 1, Item 8), washer (Figure 1, Item 9), and retaining ring (Figure 1, Item 10) on disc (Figure 1, Item 4).
2. Install two plugs (Figure 1, Item 6), lever bushing (Figure 1, Item 11), pin (Figure 1, Item 12), disc (Figure 1, Item 4), and new O-ring (Figure 1, Item 5) on check valve (Figure 1, Item 7).
3. Install retaining ring (Figure 1, Item 1), cap (Figure 1, Item 2), and O-ring (Figure 1, Item 3) on check valve (Figure 1, Item 7).

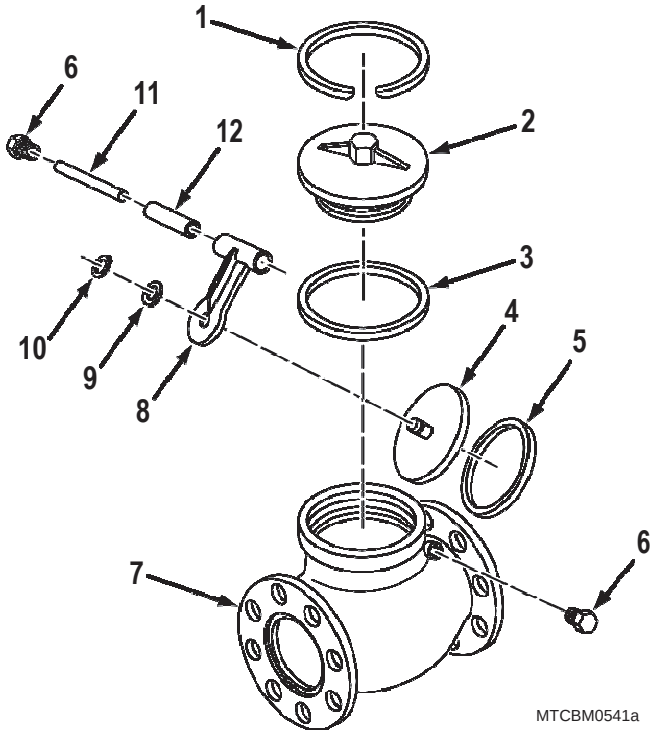


Figure 1. Check Valve Assembly.

END OF TASK

FOLLOW ON TASK

Install check valve assembly (WP 0277).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
G, M, P, AND R VALVE ASSEMBLY MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Materials/Parts
- Bearing, Bottom (WP 0295, Table 1, Item 107)
- O-Ring Qty: (3) (WP 0295, Table 1, Item 104)
- Pin, Cotter (WP 0295, Table 1, Item 113)
- Pin, Groove (WP 0295, Table 1, Item 93)
- Rag, Wiping (WP 0293, Table 1, Item 20)
- Seal, Plain Encased

Materials/Parts (cont.)
- (WP 0295, Table 1, Item 103)
- Seal, Valve (WP 0295, Table 1, Item 105)
- Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)

Equipment Condition
- G, M, P, and/or R valve assembly removed (WP 0280)
- Semitrailer bonded and grounded (WP 0008)
- Semitrailer uncoupled (WP 0007)

NOTE

This task can be used for repair of the G, M, P, and R valve assemblies. The R valve assembly is shown.

DISASSEMBLY

1. Remove handle (Figure 1, Item 2), cotter pin (Figure 1, Item 3), top pin (Figure 1, Item 4), and clip (Figure 1, Item 5) from valve stem (Figure 1, Item 8). Discard cotter pin (Figure 1, Item 3).
2. Remove two screws (Figure 1, Item 1) and stop plate (Figure 1, Item 6) from valve body (Figure 1, Item 18).
3. Remove valve seal (Figure 1, Item 9), split bearing (Figure 1, Item 11), two O-rings (Figure 1, Items 10 and 12), and top seal (Figure 1, Item 7) from valve body (Figure 1, Item 18). Discard valve seal (Figure 1, Item 9), top seal (Figure 1, Item 7), and O-rings (Figure 1, Items 10 and 12).
4. Remove spring pin (Figure 1, Item 14), bottom stem (Figure 1, Item 15), and O-ring (Figure 1, Item 16) from valve body (Figure 1, Item 18). Discard spring pin (Figure 1, Item 14) and O-ring (Figure 1, Item 16).
5. Remove and discard bearing (Figure 1, Item 17) from bottom stem (Figure 1, Item 15).
6. Remove disc (Figure 1, Item 13) and sleeve (Figure 1, Item 19) from valve body (Figure 1, Item 18).

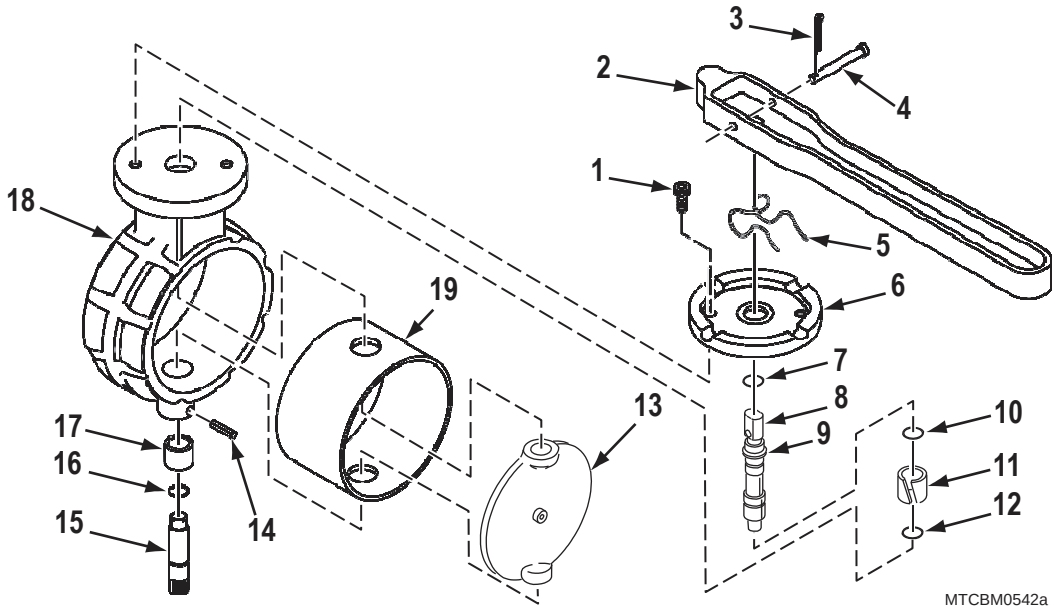


Figure 1. G, M, P, and R Valve Replacement.

END OF TASK

CLEANING AND INSPECTION

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Clean all metal parts with solvent and clean dry rags.
2. Inspect metal parts for cracks, scoring, and pitting. Replace any damaged parts.

END OF TASK

ASSEMBLY

NOTE

The only difference in the four valves is different size disc and sleeves. When assembling disc and sleeves, verify that size is correct.

1. Install disc (Figure 2, Item 13) and sleeve (Figure 2, Item 19) in valve body (Figure 2, Item 18).
2. Install new bearing (Figure 2, Item 17) on bottom stem (Figure 2, Item 15).
3. Install bottom stem (Figure 2, Item 15) and new O-ring (Figure 2, Item 16) in valve body (Figure 2, Item 18) with new spring pin (Figure 2, Item 14).
4. Install split bearing (Figure 2, Item 11), two new O-rings (Figure 2, Items 10 and 12), valve seal (Figure 2, Item 9), and top seal (Figure 2, Item 7) on valve stem (Figure 2, Item 8). Install valve stem (Figure 2, Item 8) in valve body (Figure 2, Item 18).
5. Install stop plate (Figure 2, Item 6) on valve body (Figure 2, Item 18) with two screws (Figure 2, Item 1).
6. Install new cotter pin (Figure 2, Item 3), top pin (Figure 2, Item 4), handle (Figure 2, Item 2), and clip (Figure 2, Item 5) on valve body (Figure 2, Item 18).

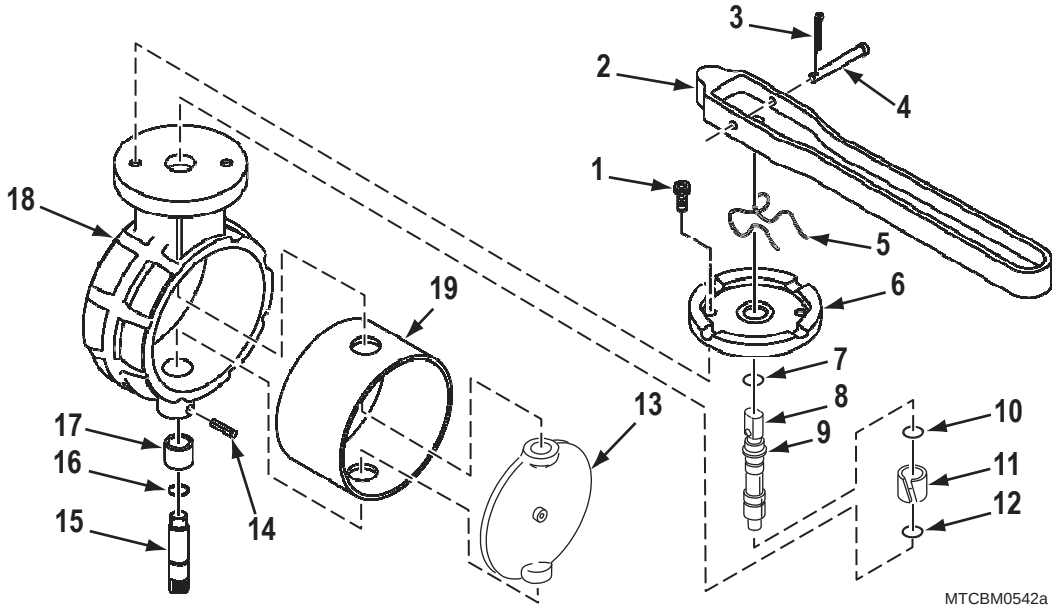


Figure 2. G, M, P, and R Valve Assembly.

END OF TASK

FOLLOW ON TASK

Install G, M, P, and/or R valve assembly (WP 0280).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
G, M, P, AND R VALVE ASSEMBLY REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (16) (WP 0295, Table 1, Item 164)

Equipment Condition
Semitrailer uncoupled (WP 0007)

WARNING

Accidental or intentional introduction of liquid contaminants into the environment is a violation of state, federal, and military regulations. Refer to Army Petroleum, Oils, and Lubricants (POL) for information concerning storage, use, and disposal of these liquids. Failure to comply may cause damage to environment and health of personnel. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

NOTE

There are four of these valves. This procedure covers the replacement of one. All others are replaced the same.

REMOVAL

1. Remove 16 self-locking nuts (Figure 1, Item 3), washers (Figure 1, Item 2), and eight studs (Figure 1, Item 1) from two flanges (Figure 1, Item 4), and valve (Figure 1, Item 5). Discard self-locking nuts (Figure 1, Item 3).
2. Remove valve (Figure 1, Item 5) from two flanges (Figure 1, Item 4).

END OF TASK

INSTALLATION

Install valve (Figure 1, Item 5) on two flanges (Figure 1, Item 4) with eight studs (Figure 1, Item 1), 16 washers (Figure 1, Item 2), and new self-locking nuts (Figure 1, Item 3).

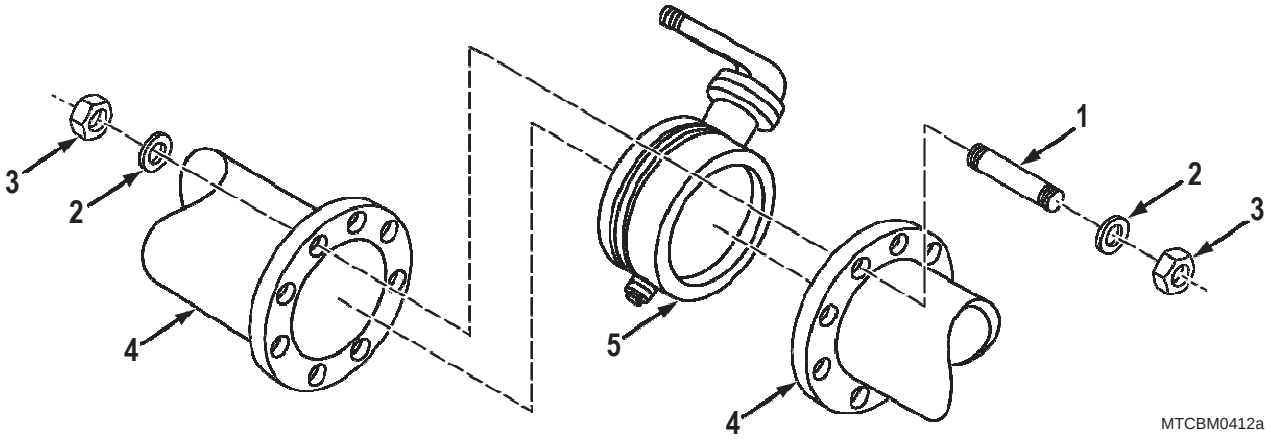


Figure 1. G, M, P, and R Valve Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
EMERGENCY VALVE CONTROL HANDLE MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
- Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)
- Gloves, Chemical and Oil Protective (WP 0294, Table 1, Item 10)

Materials/Parts
- Nut, Self-Locking
  - Qty: (2) (WP 0295, Table 1, Item 176)
- Pin, Cotter (WP 0295, Table 1, Item 113)

Materials/Parts (cont.)
- Rag, Wiping (WP 0293, Table 1, Item 20)
- Solvent, Cleaning Compound (WP 0293, Table 1, Item 25)

Equipment Condition
- Semitrailer uncoupled WP 0007
- Semitrailer bonded and grounded WP 0008
- Emergency valve A control cables disconnected WP 0272

DISASSEMBLY

1. Remove two screws (Figure 1, Item 7), self-locking nuts (Figure 1, Item 6), and emergency valve A control handle mounting bracket (Figure 1, Item 5) from toolbox (Figure 1, Item 8). Discard self-locking nuts (Figure 1, Item 6).
2. Remove pin (Figure 1, Item 4), shaft (Figure 1, Item 3), control handle (Figure 1, Item 1), and trip bracket (Figure 1, Item 2) from mounting bracket (Figure 1, Item 5).

NOTE

Nuts and plate are provisioned with U-bolt.

3. Remove two nuts (Figure 1, Item 2), plate (Figure 1, Item 3), and U-bolt (Figure 1, Item 4) from trip bracket (Figure 1, Item 2).

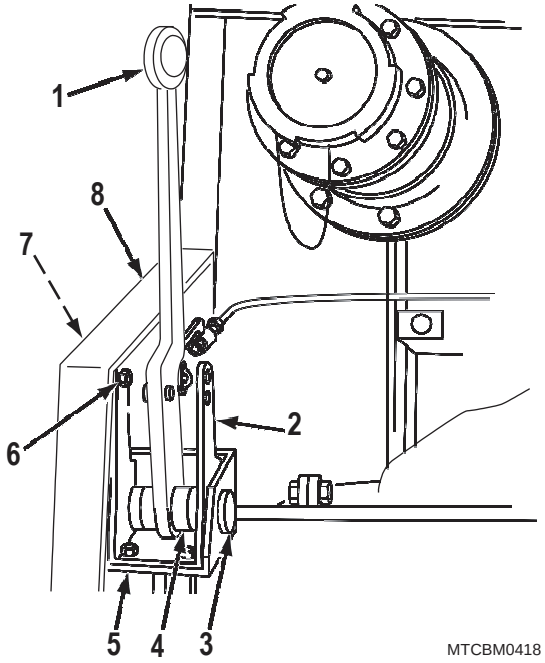


Figure 1. Emergency Valve A Control Handle Disassembly.

END OF TASK

CLEANING AND INSPECTION

WARNING

- Solvent cleaning compound MIL-PRF-680 may be irritating to the eyes and skin. Wear protective gloves and eyewear. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Use solvent cleaning compound MIL-PRF-680 in a well-ventilated area. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract. May cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: DO NOT induce vomiting. Seek immediate medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- MIL-PRF-680 solvent is combustible: DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in confined space, heated above ambient temperatures, or agitated. Keep container sealed when not in use. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.
- Cloths or rags saturated with solvent cleaning compound must be disposed of in accordance with authorized facility procedures. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Use a drain pan or appropriate containment equipment to capture any draining or leaking fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Comply with local regulations when disposing of clean up material and leaked and spilled fluids. Failure to comply may result in damage to, or destruction of, equipment or mission.

1. Clean all parts with degreasing solvent and wipe dry with clean dry rags.
2. Inspect pin (Figure 1, Item 4) and plate (Figure 1, Item 3) for bends, pits, or cracks. Replace damaged components.
3. Inspect control handle (Figure 1, Item 1), trip bracket (Figure 1, Item 5), and mounting bracket (Figure 1, Item 8) for cracked welds, bends, or other unserviceable condition. Replace unserviceable components.

END OF TASK

ASSEMBLY

1. Install control handle (Figure 2, Item 1) and trip bracket (Figure 2, Item 5) in emergency valve A control handle mounting bracket (Figure 2, Item 8) with shaft (Figure 2, Item 6) and straight pin (Figure 2, Item 7).
2. Install plate (Figure 2, Item 4) and U-bolt (Figure 2, Item 3) on trip bracket (Figure 2, Item 5) with two nuts (Figure 2, Item 2).
3. Install emergency valve A control handle mounting bracket (Figure 2, Item 8) on toolbox (Figure 2, Item 11) with two screws (Figure 2, Item 10) and new self-locking nuts (Figure 2, Item 9).

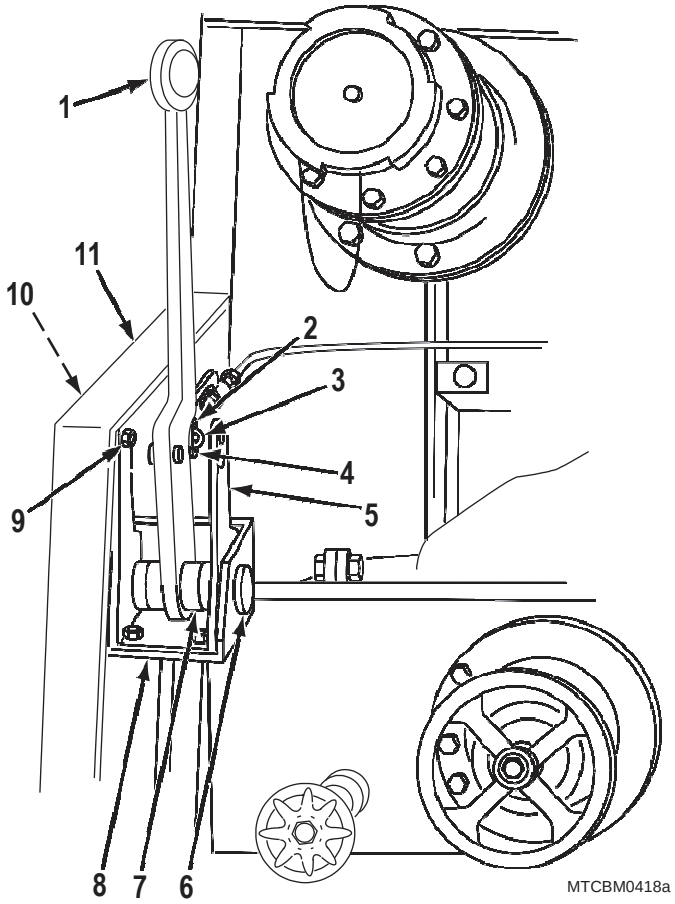


Figure 2. Emergency Valve A Control Handle Assembly.

END OF TASK

FOLLOW ON TASK

Connect and adjust emergency valve A control cables (WP 0272).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CONTROL CABLES MAINTENANCE

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

Materials/Parts
Pin, Cotter
(WP 0295, Table 1, Item 179)

Personnel Required
Two

Equipment Condition
Semitrailer bonded and grounded (WP 0008)
Semitrailer uncoupled (WP 0007)

DISASSEMBLY

1. Loosen two nuts (Figure 1, Item 3) and U-bolt (Figure 1, Item 4) on lever (Figure 1, Item 1) of emergency valve A (Figure 1, Item 2).
2. Pull control cable (Figure 1, Item 5) free of lever (Figure 1, Item 1) of emergency valve A (Figure 1, Item 2).

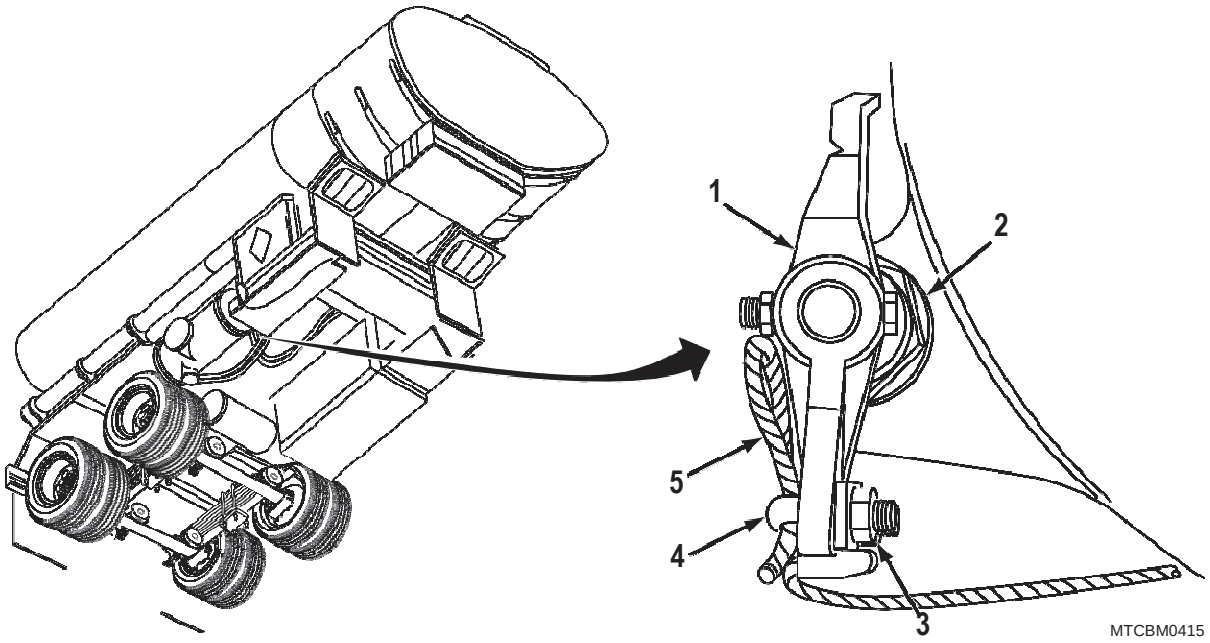


Figure 1. Control Cable Lever Removal.

DISASSEMBLY - Continued

3. Remove cotter pin (Figure 2, Item 9), straight pin (Figure 2, Item 10), and connecting link (Figure 2, Item 14) from emergency valve A control handle (Figure 2, Item 8). Discard cotter pin (Figure 2, Item 9).
4. Pull control cable (Figure 2, Item 3) free of bracket (Figure 2, Item 2) and remove control cable (Figure 2, Item 3) from semitrailer.
5. Remove three nuts (Figure 2, Items 4, 13, and 15), connecting link (Figure 2, Item 14), and stud (Figure 2, Item 5) from control cable (Figure 2, Item 3).
6. Loosen two nuts (Figure 3, Item 4) on U-bolt (Figure 3, Item 3) on shut-off lever handle (Figure 3, Item 1).
7. Pull control cable (Figure 3, Item 2) free of post (Figure 2, Item 1).
8. Loosen two nuts (Figure 2, Item 11) on U-bolt (Figure 2, Item 7) on trip bracket (Figure 2, Item 12) and remove control cable (Figure 2, Item 6) from trip bracket (Figure 2, Item 12)

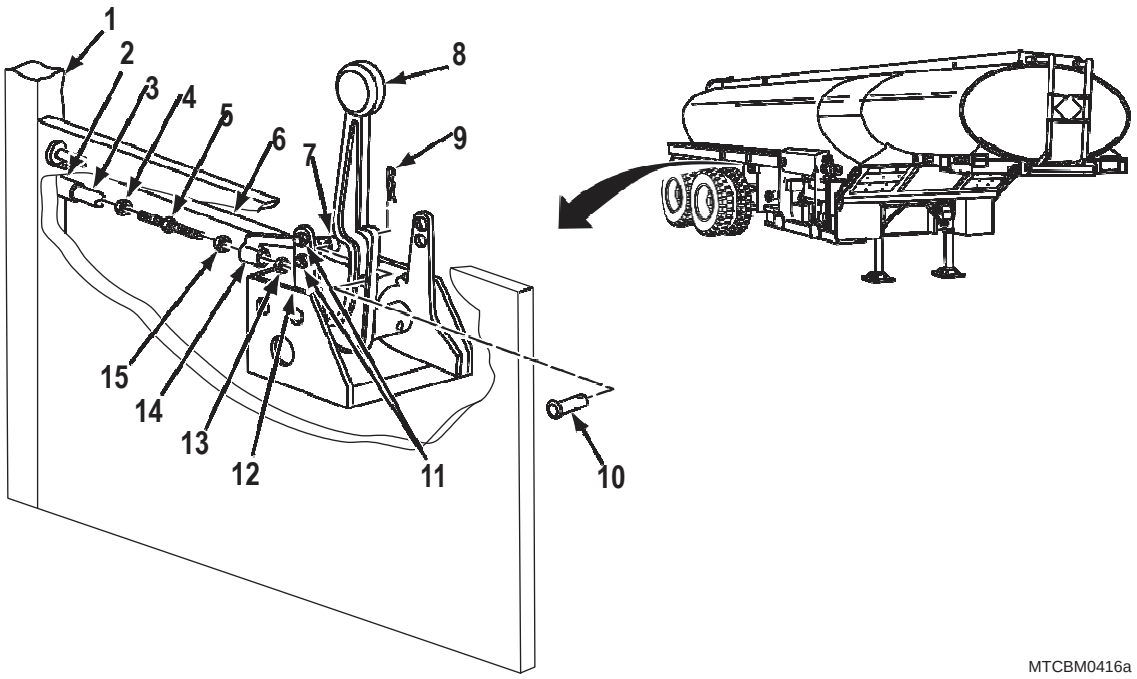


Figure 2. Shut-Off Lever Handle Replacement.

.

END OF TASK

ASSEMBLY

1. Install control cable (Figure 2, Item 6) on trip bracket (Figure 2, Item 12) with U-bolt (Figure 2, Item 7) and two nuts (Figure 2, Item 11).
2. Route control cable (Figure 2, Item 6) through post (Figure 2, Item 1) to shut-off lever handle (Figure 3, Item 1).
3. Install control cable (Figure 3, Item 2) on shut-off lever handle (Figure 3, Item 1) with U-bolt (Figure 3, Item 3) and two nuts (Figure 3, Item 4).
4. Install control cable (Figure 2, Item 3) through bracket (Figure 2, Item 2).
5. Install stud (Figure 2, Item 5), connecting link (Figure 2, Item 14), and three nuts (Figure 2, Items 4, 13, and 15) on control cable (Figure 2, Item 3).
6. Install connecting link (Figure 2, Item 14) on emergency valve A control handle (Figure 2, Item 8) with straight pin (Figure 2, Item 10) and new cotter pin (Figure 2, Item 9).

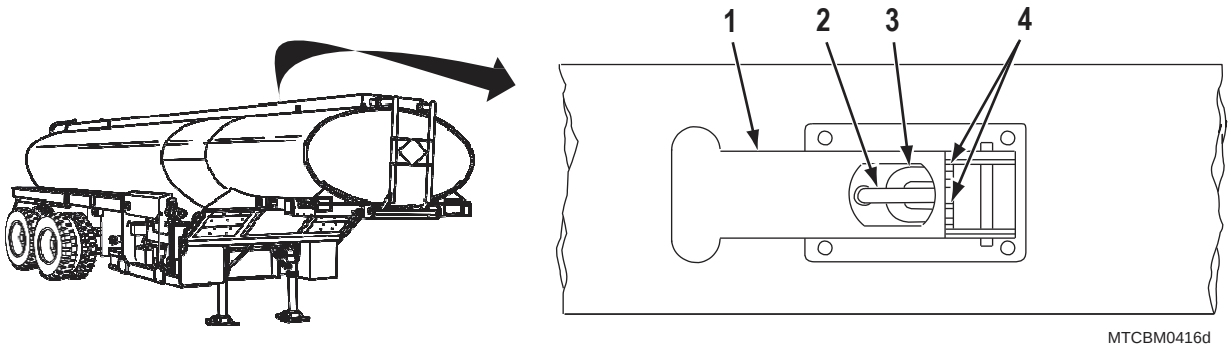


Figure 3. Control Cable Replacement.

ASSEMBLY - Continued

7. Route control cable (Figure 4, Item 5) to lever of emergency valve A (Figure 4, Item 1).
8. Install control cable (Figure 4, Item 5) on lever of emergency valve A (Figure 4, Item 1) with U-bolt (Figure 4, Item 4) and two nuts (Figure 4, Item 3)

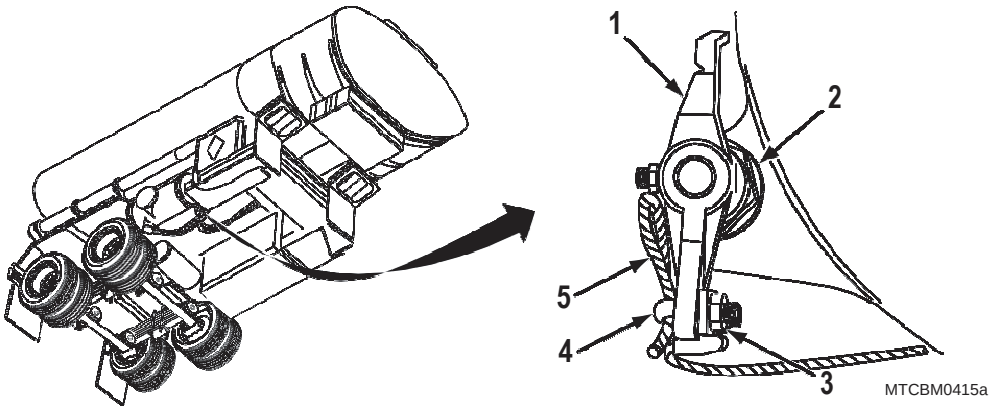


Figure 4. Control Cable Adjustment.

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END OF TASK

ADJUSTMENT

NOTE

Make sure emergency valve A is closed and that emergency valve A control handle is up.

1. Loosen two nuts (Figure 4, Item 3) and U-bolt (Figure 4, Item 4) on lever (Figure 4, Item 1) of emergency valve A (Figure 4, Item 2).
2. Remove all slack from control cable (Figure 4, Item 5), and tighten two nuts (Figure 4, Item 3) and U-bolt (Figure 4, Item 4).

NOTE

Have an assistant observe the operation of emergency valve A.

3. Pull control handle (Figure 5, Item 1) and check that emergency valve A (Figure 4, Item 2) opens. Push control handle (Figure 5, Item 1) to upright position and check that emergency valve A (Figure 4, Item 2) closes.
4. Pull shut-off lever handle (Figure 6, Item 1) to open position.
5. Loosen U-bolt (Figure 6, Item 3) and two nuts (Figure 6, Item 4) on shut-off lever handle (Figure 6, Item 1), and remove all slack from control cable (Figure 6, Item 2). Tighten two nuts (Figure 6, Item 4) and U-bolt (Figure 6, Item 3).

ADJUSTMENT - Continued

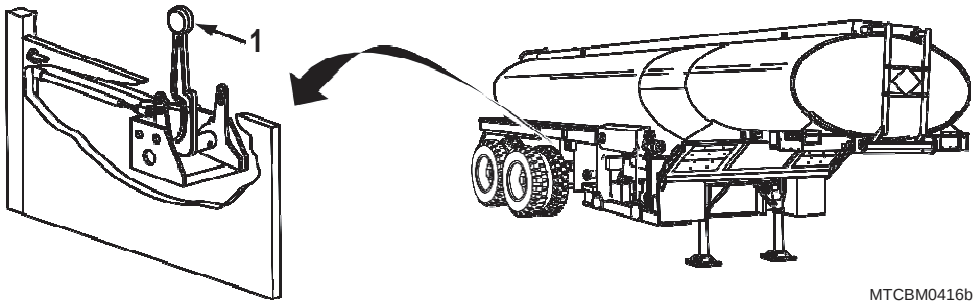


Figure 5. Shut-Off Lever Handle Adjustment.

NOTE

- It may be necessary to repeat Steps 1 through 6 until control handle and shut-off lever operate properly.
- Have an assistant observe operation of shut-off lever.

6. Pull control handle (Figure 5, Item 1) and check that shut-off lever handle (Figure 6, Item 1) moves to closed position, and that emergency valve A (Figure 4, Item 2) opens.
7. Pull shut-off lever handle (Figure 6, Item 1) and check that emergency valve A (Figure 4, Item 2) closes and control handle (Figure 5, Item 1) moves to upright position.

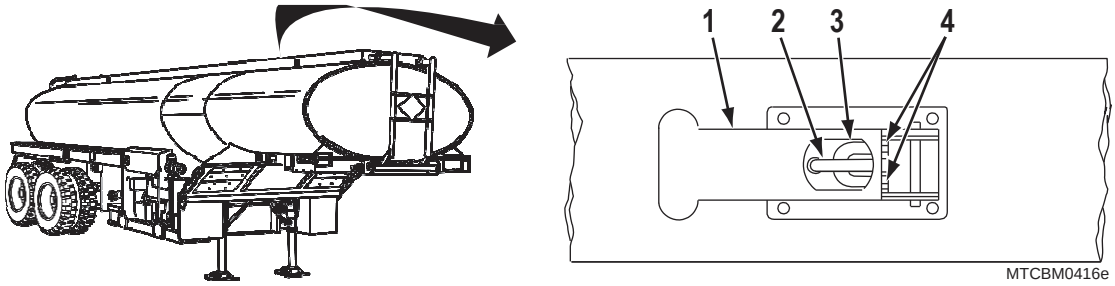


Figure 6. Control Handle Adjustment.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FIRE EXTINGUISHER BRACKET REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking

Materials/Parts (cont.)
Qty: (4) (WP 0295, Table 1, Item 174)

Equipment Condition
Semitrailer uncoupled (WP 0007)

NOTE

There are 2 of these fire extinguisher brackets. This procedure covers the replacement of one. All others are replaced the same.

REMOVAL

Remove four self-locking nuts (Figure 1, Item 3), washers (Figure 1, Item 4), screws (Figure 1, Item 1), and fire extinguisher mounting bracket (Figure 1, Item 2) from semitrailer. Discard self-locking nuts (Figure 1, Item 3).

END OF TASK

INSTALLATION

Install fire extinguisher mounting bracket (Figure 1, Item 2) on semitrailer with four screws (Figure 1, Item 1), washers (Figure 1, Item 4), and new self-locking nuts (Figure 1, Item 3).

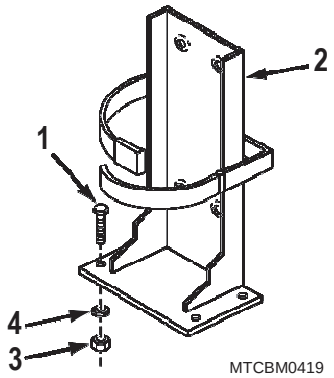


Figure 1. Fire Extinguisher Bracket Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
DECONTAMINATION APPARATUS BRACKET REPLACEMENT

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (WP 0294, Table 1, Item 19)

Materials/Parts
Nut, Self-Locking

Materials/Parts (cont.)
Qty: 4 (WP 0295, Table 1, Item 164)

Equipment Condition
Semitrailer uncoupled (WP 0007)

REMOVAL

1. Remove four screws (Figure 1, Item 1), washers (Figure 1, Item 2), and self-locking nuts (Figure 1, Item 3) from bracket assembly (Figure 1, Item 4). Discard self-locking nuts (Figure 1, Item 3).
2. Remove bracket assembly (Figure 1, Item 4) from rear fender deck of semitrailer.

END OF TASK

INSTALLATION

1. Position bracket assembly (Figure 1, Item 4) on rear fender deck of semitrailer with four mounting holes aligned.
2. Install four screws (Figure 1, Item 1), washers (Figure 1, Item 2), and new self-locking nuts (Figure 1, Item 3) to secure bracket assembly (Figure 1, Item 4).

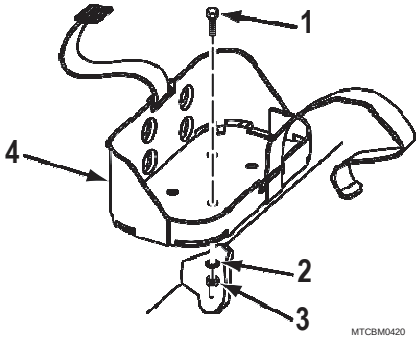


Figure 1. Decontamination Apparatus Bracket Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
COMPRESSION LINE REPAIR

INITIAL SETUP:

Tools and Special Tools
Tool Kit, General Mechanic's Automotive
(WP 0294, Table 1, Item 19)

References
TM 9-2330-339-23P

NOTE

This procedure is for assembling or repairing a compression line. Sizes reflect factory recommendations. Hoses or lines may or may not have identical fittings on both ends. This procedure replaces one end. For correct line length and component breakdown, refer to TM 9-2330-339-23P.

REPAIR

NOTE

Nut can be reused. Sleeve and insert cannot be reused, but can be ordered separately.

1. Cut end of compression line (Figure 1, Item 2), in a 0° with less then 15° angle and remove nut end (Figure 1, Item 1).

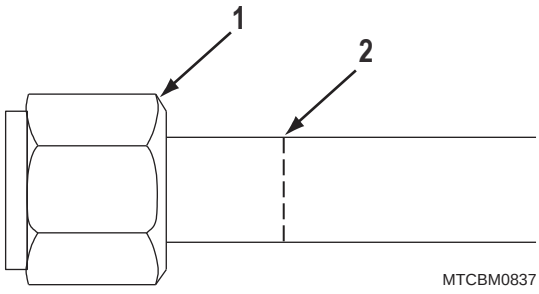


Figure 1. Compression Line Termination.

REPAIR - Continued

2. Slide nut (Figure 2, Item 2), then compression sleeve (Figure 2, Item 3), over hose (Figure 2, Item 1).
3. Insert tube (Figure 2, Item 4) into hose (Figure 2, Item 1).

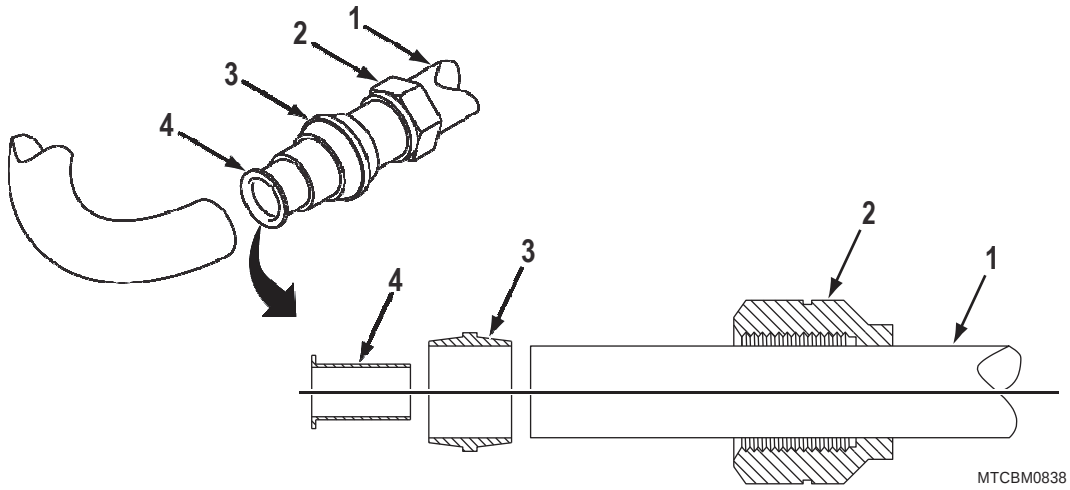


Figure 2. Compression Line Component Assembly.

NOTE

Fitting shown is example. Compression line should be installed on connecting fitting.

4. Insert hose (Figure 3, Item 5), with nut (Figure 3, Item 4), compression sleeve (Figure 3, Item 3), and tube (Figure 3, Item 2), onto connecting fitting (Figure 3, Item 1).
5. Ensure tubing (Figure 3, Item 2), is seated into fitting (Figure 3, Item 1).

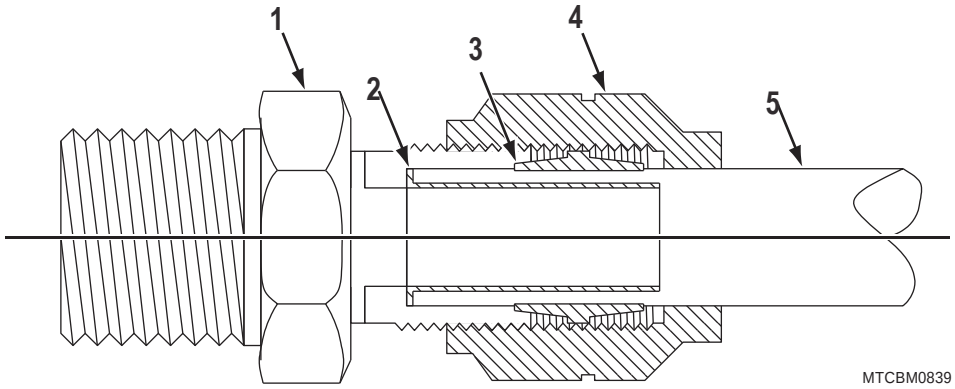


Figure 3. Connecting Fitting Assembly.

REPAIR - Continued

NOTE

There are two methods for installation of nut onto fitting. Perform either step 6 or step 7 but not both.

6. Tighten nut (Figure 4, Item 2), until one thread remains visible on the fitting body (Figure 4, Item 1); (this will allow for a number of remakes).
7. Tighten nut (Figure 4, Item 2), finger tight, then the wrench-tighten as indicated in the following table.

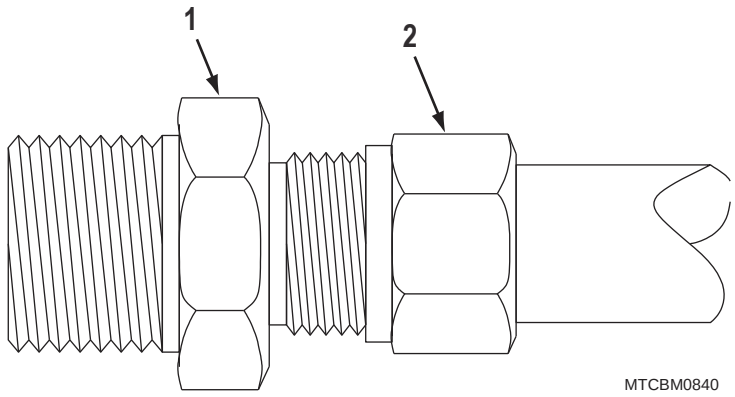


Figure 4. Nut Tightening.

Table 1. Number of Turns on Nut.

Tube Size	Additional Number of Turns
3/16 in. (0.48 cm)	2-1/2
1/4 in. (0.63 cm)	3
3/8 in. (0.95 cm) and 1/2 in. (1.27 cm)	4
5/8 in. (1.58 cm) and 3/4 in. (1.90 cm)	3-1/2

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
LUBRICATION INSTRUCTIONS

INITIAL SETUP:

Tools and Special Tools
Gloves, Chemical and Oil Protective
(WP 0294, Table 1, Item 10)

Materials/Parts
Solvent, Cleaning Compound

Materials/Parts (cont.)
(WP 0293, Table 1, Item 25)

References
DA Pam 750-8
FM 9-207

LUBRICATION INSTRUCTIONS

NOTE

These instructions are MANDATORY.

1. The semitrailers must receive lubrication with approved lubricants at recommended intervals in order to be mission-ready at all times. To prevent corrosion, apply a light coat of lubricating oil to metal parts after they are cleaned but before they are assembled. Lubricate components and systems in accordance with these instructions.
2. The KEY lists lubricants to be used in all temperature ranges and shows the intervals.
3. The Lubrication Chart shows lubrication points, items to be lubricated, required lubricants, and recommended intervals for lubrication.
4. Recommended intervals are based on normal conditions of operation, temperature, and humidity. When operating under extreme conditions, lubricants should always be changed more frequently. When in doubt, notify your supervisor.

SPECIFIC LUBRICATION INSTRUCTIONS

1. Keep all lubricants in a closed container and store in a clean, dry place away from extreme heat. Keep container covers clean and do not allow dust, dirt, or other foreign material to mix with lubricants. Keep all lubrication equipment clean and ready for use.
2. Maintain a record of lubrication performed and report any problems noted during lubrication. Refer to DA Pam 750-8 for maintenance forms and procedures for recording and reporting any findings.

WARNING

Wipe excess lubricant from the area of brake shoe linings to prevent grease from soaking the linings. If brake shoe linings become soaked, have Field Maintenance replace them. Failure to follow this warning may cause brakes to malfunction. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

3. Keep brake shoe linings and all external parts not requiring lubrication free of lubricants. After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.
4. Refer to FM 9-207 for lubrication instructions in cold weather.
5. After operation in mud, sandy, or dusty conditions, clean and inspect all points of lubrication for fouled lubricants. Change lubricants as required.
6. Intervals (on-condition or hard time) and related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all services prescribed for a particular interval. Decrease the intervals if your lubricants are contaminated or if you are operating equipment under adverse conditions, including longer than usual operating hours. The intervals may be extended during periods of low activity. If extended, adequate preservation precautions must be taken.

WARNING

Cleaning solvent MIL-PRF-680 is toxic and flammable. ALWAYS wear protective eyewear and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat. The solvent's flash point is 100°F-138°F (38°C-59°C). If you become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts eyes, immediately wash your eyes and get medical aid. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

7. Clean all fittings and areas around lubrication points with solvent, or equivalent, before lubricating equipment. After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

LUBRICATION CHART

SEMITRAILER, TANK: 5000 GAL. BULK HAUL, SELF LOAD/UNLOAD M967A1 (2330-01-155-0046)

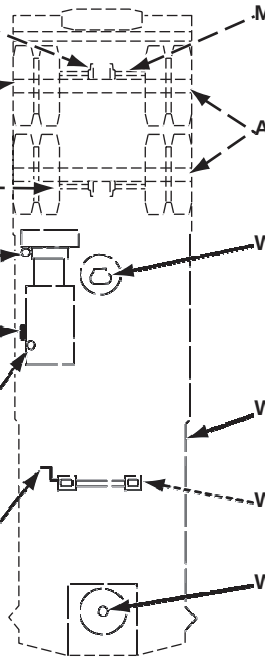
Intervals (on-condition or hard time) and related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all services prescribed for a particular interval. Decrease the intervals if your lubricants are contaminated or if you are operating equipment under adverse conditions, including longer-than-usual operating hours. The intervals may be extended during periods of low activity. If extended, adequate preservation precautions must be taken. Dotted leader lines indicate lubrication is required on both sides of the equipment.

WARNING

Solvent cleaning compound MIL-PRF-680 is toxic and flammable. Always wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and DO NOT breathe vapors. DO NOT use near open flames or excessive heat. The solvent's flash point is 100°F-138°F (38°C-59°C). If you become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts eyes, immediately wash your eyes and get medical aid.

The lowest level of maintenance authorized to lubricate a point is indicated in parentheses by use of the following: (C) Operator or (F) Field Maintenance. Clean all fittings and area around lubrication points with cleaning solvent MIL-PRF-680 or equivalent before lubricating equipment. After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.

		LUBRICANT	INTERVAL
N Fig. 18	**Slack Adjuster (F)** (Front and rear axles)	GAA	M
Q Fig. 19	**Brake Shoe Roller (F)** (Front and rear axles)	PL	S
P Fig. 19	**Brake Anchor Pin (F)** (Front and rear axles)	GAA	S
H Fig. 14	**Centrifugal Pump (F)** (Remove pipe plug and fill to bottom of pipe plug hole.)	OE/HDO	W
F Fig. 12	**Engine Oil Drain (F)** (Remove drain plug. Refill capacity 6 quarts. Add 1 pint for filter.) (Onan)	OE/HDO	H
E Fig. 12	**Engine Crankcase Fill and Level (F)** (Check level) (Onan)	OE/HDO	W
C Fig. 12	**Landing Gear Handle (C)**	OE/HDO	W



		INTERVAL	LUBRICANT
R Fig. 20	**Camshaft Bearings (F)** (Front and rear axles)	M	GAA
	Wheel Bearings (8) (F) (Every 12,000 miles or annually inspect.)	A/T	GAA
B Fig. 11	**Manhole Hinges (C)**	W	OE/HDO
V Fig. 23	**Control Panel Cover Hinge and Latch (C)**	W	OE/HDO
D Fig. 12	**Landing Gear Footpads (C)**	W	OE/HDO
G Fig. 13	**Pick-up and Kingpin (C)**	W	GAA

TOTAL MAN-HR	
INTERVAL	MAN-HR
W	0.6

TOTAL MAN-HR	
INTERVAL	MAN-HR
H (100)	0.3

MTCBM0725

Figure 1. Lubrication Chart (M967A1) (Sheet 1 of 3).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

LUBRICATION CHART

SEMITRAILER, TANK: 5000 GAL. BULK HAUL, SELF LOAD/UNLOAD M967A1 (2330-01-155-0046)

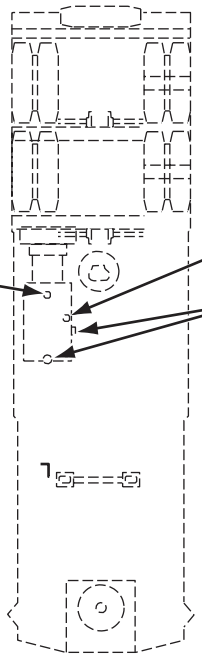
Intervals (on-condition or hard time) and related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all services prescribed for a particular interval. Decrease the intervals if your lubricants are contaminated or if you are operating equipment under adverse conditions, including longer-than-usual operating hours. The intervals may be extended during periods of low activity. If extended, adequate preservation precautions must be taken. Dotted leader lines indicate lubrication is required on both sides of the equipment.

WARNING

Solvent cleaning compound MIL-PRF-680 is toxic and flammable. Always wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and DO NOT breathe vapors. DO NOT use near open flames or excessive heat. The solvent's flash point is 100°F-138°F (38°C-59°C). If you become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts eyes, immediately wash your eyes and get medical aid.

The lowest level of maintenance authorized to lubricate a point is indicated in parentheses by use of the following: (C) Operator or (F) Field Maintenance. Clean all fittings and area around lubrication points with cleaning solvent MIL-PRF-680 or equivalent before lubricating equipment. After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.

LUBRICANT	INTERVAL		INTERVAL	LUBRICANT
W Fig. 24	Engine Crankcase Fill (F) (Lombardini)	OE/HDO W	W OE/HDO Check Level (F) (Lombardini)	X Fig. 24
			H OE/HDO Engine Oil Drain (F) (Remove drain plug. Refill capacity 5.29 quarts.) (Lombardini)	Y Fig. 24



TOTAL MAN-HR		TOTAL MAN-HR	
INTERVAL	MAN-HR	INTERVAL	MAN-HR
W	0.6	H (100)	0.3

MTCBM0726

Figure 2. Lubrication Chart (M967A1) (Sheet 2 of 3).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

KEY

LUBRICANT		REFILL CAPACITY (APP)	EXPECTED TEMPERATURE				INTERVAL
			Above 32°	40°F to -10°F	0°F to -55°F		
OE/HDO (MIL-L-2104)	Lubricating oil internal combustion engine.		OE/HDO-30	OE/HDO-20	OEA	For Arctic Operation, Refer to FM 9-207	D - Daily W - Weekly M - Monthly S - Semiannually A - Annually H - Hours
or							
OEA (MIL-L-46167)	Engine crankcase (Onan)	6 quarts, plus 1 pint for oil filter					
	Engine crankcase (Lombardini)	5.29 quarts					
GAA (MIL-G-10924)	Grease, Automotive and artilery	as req'd	All Temperature				
PL (PL-S-VV-L-800)	Preservative oil		PL - Medium	PL - Special	PL - Special		
or							
PL (PL-M-MIL-L-3150)							

MTCBM0727

Figure 3. Lubrication Chart (M967A1) (Sheet 3 of 3).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

LUBRICATION CHART

SEMITRAILER, TANK: 5000 GAL. BULK HAUL, SELF LOAD/UNLOAD M969A1 (2330-01-155-0048)

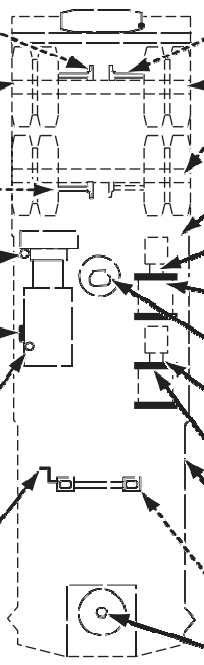
Intervals (on-condition or hard time) and related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all services prescribed for a particular interval. Decrease the intervals if your lubricants are contaminated or if you are operating equipment under adverse conditions, including longer-than-usual operating hours. The intervals may be extended during periods of low activity. If extended, adequate preservation precautions must be taken. Dotted leader lines indicate lubrication is required on both sides of the equipment.

WARNING

Solvent cleaning compound MIL-PRF-680 is toxic and flammable. Always wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and DO NOT breathe vapors. DO NOT use near open flames or excessive heat. The solvent's flash point is 100°F-138°F (38°C-59°C). If you become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts eyes, immediately wash your eyes and get medical aid.

The lowest level of maintenance authorized to lubricate a point is indicated in parentheses by use of the following: (C) Operator or (F) Field Maintenance. Clean all fittings and area around lubrication points with cleaning solvent MIL-PRF-680 or equivalent before lubricating equipment. After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.

		LUBRICANT	INTERVAL
N Fig. 18	Slack Adjuster (F) (Front and rear axles)	GAA	M
Q Fig. 19	Brake Shoe Roller (F) (Front and rear axles)	PL	S
P Fig. 19	Brake Anchor Pin (F) (Front and rear axles)	GAA	S
H Fig. 14	Centrifugal Pump (F) (Remove pipe plug and fill to bottom of pipe plug hole.)	OE/HDO	W
F Fig. 12	Engine Oil Drain (F) (Remove drain plug. Refill capacity 6 quarts. Add 1 pint for filter.) (Onan)	OE/HDO	H
E Fig. 12	Engine Crankcase Fill and Level (F) (Check level) (Onan)	OE/HDO	W
C Fig. 12	Landing Gear Handle (C)	OE/HDO	W



		INTERVAL	LUBRICANT	
Camshaft Bearings (F) (Front and rear axles)	R Fig. 20	M	GAA	
Wheel Bearings (8) (F) (Every 12,000 miles or annually inspect.)	T Fig. 21	A/T	GAA	
Hose Reel Cabinet Door Hinges and Latches (C)	U Fig. 22	W	OE/HDO	
Hose Reel Hand Crank Operating Shaft (C)	J Fig. 15	W	GAA	
Hose Reel Side Bearings (C)	I Fig. 15	W	OE/HDO	
Manhole Hinges (C)	B Fig. 11	W	OE/HDO	
Hose Reel Hand Crank Operating Shaft (C)	J Fig. 15	W	GAA	
Hose Reel Side Bearings (C)	I Fig. 15	W	OE/HDO	
Control Panel Cover Hinge and Latch (C)	V Fig. 23	W	OE/HDO	
Landing Gear Footpads (C)	D Fig. 12	W	OE/HDO	
Pick-up and Kingpin (C)	G Fig. 13	W	GAA	

TOTAL MAN-HR	
INTERVAL	MAN-HR
A	1.0
W	0.6
M	0.4

TOTAL MAN-HR	
INTERVAL	MAN-HR
S	0.4
H (100)	0.3

MTCBM0731

Figure 4. Lubrication Chart (M969A1) (Sheet 1 of 3).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

LUBRICATION CHART

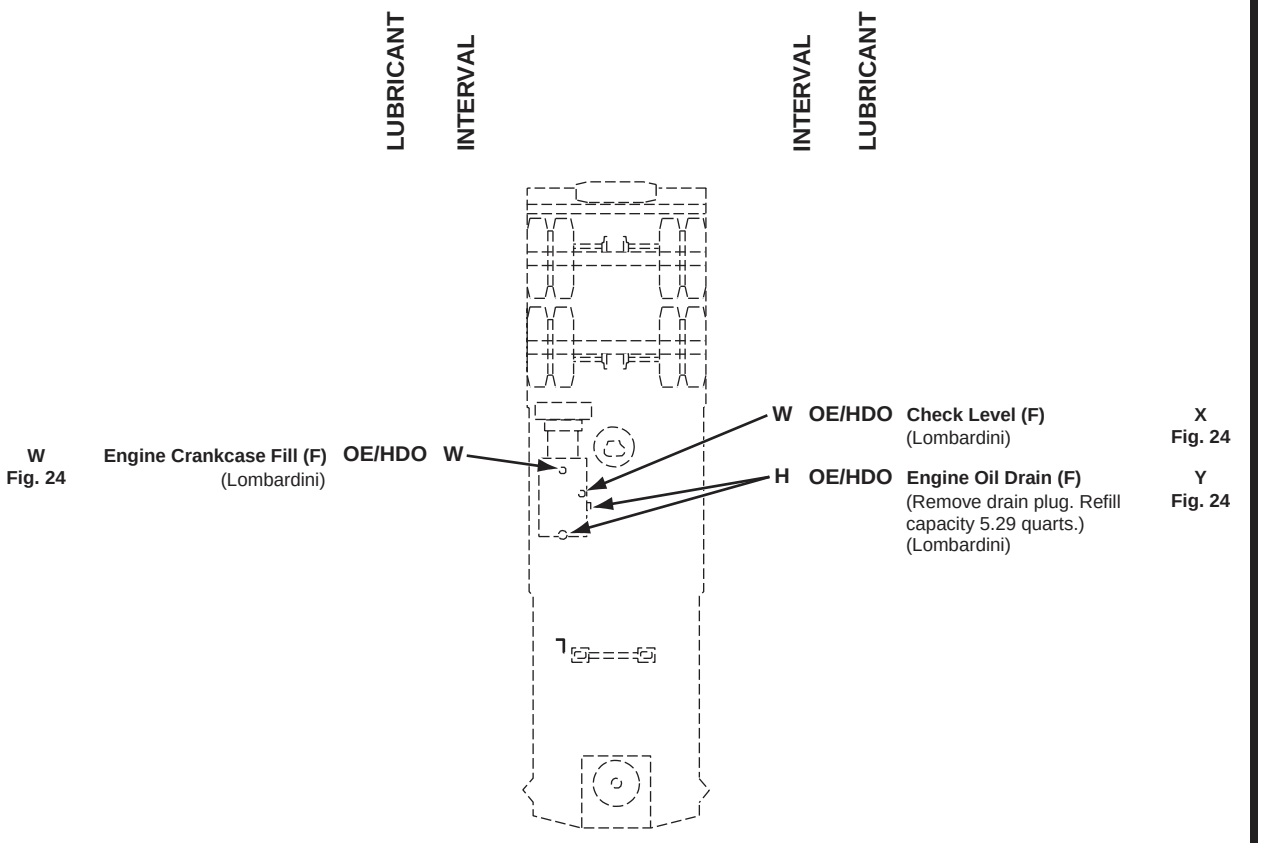
SEMITRAILER, TANK: 5000 GAL. BULK HAUL, SELF LOAD/UNLOAD M969A1 (2330-01-155-0048)

Intervals (on-condition or hard time) and related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all services prescribed for a particular interval. Decrease the intervals if your lubricants are contaminated or if you are operating equipment under adverse conditions, including longer-than-usual operating hours. The intervals may be extended during periods of low activity. If extended, adequate preservation precautions must be taken. Dotted leader lines indicate lubrication is required on both sides of the equipment.

WARNING

Solvent cleaning compound MIL-PRF-680 is toxic and flammable. Always wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and DO NOT breathe vapors. DO NOT use near open flames or excessive heat. The solvent's flash point is 100°F-138°F (38°C-59°C). If you become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts eyes, immediately wash your eyes and get medical aid.

The lowest level of maintenance authorized to lubricate a point is indicated in parentheses by use of the following: (C) Operator or (F) Field Maintenance. Clean all fittings and area around lubrication points with cleaning solvent MIL-PRF-680 or equivalent before lubricating equipment. After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.



TOTAL MAN-HR		TOTAL MAN-HR	
INTERVAL	MAN-HR	INTERVAL	MAN-HR
W	0.6	H (100)	0.3

MTCBM0732

Figure 5. Lubrication Chart (M969A1) (Sheet 2 of 3).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

KEY

LUBRICANT		REFILL CAPACITY (APP)	EXPECTED TEMPERATURE				INTERVAL
			Above 32°	40°F to -10°F	0°F to -55°F		
OE/HDO (MIL-L-2104)	Lubricating oil internal combustion engine.		OE/HDO-30	OE/HDO-20	OEA	For Arctic Operation, Refer to FM 9-207	D - Daily W - Weekly M - Monthly S - Semiannually A - Annually H - Hours
or							
OEA (MIL-L-46167)	Engine crankcase (Onan)	6 quarts, plus 1 pint for oil filter					
	Engine crankcase (Lombardini)	5.29 quarts					
GAA (MIL-G-10924)	Grease, Automotive and artilery	as req'd	All Temperature				
PL (PL-S-VV-L-800)	Preservative oil		PL - Medium	PL - Special	PL - Special		
or							
PL (PL-M-MIL-L-3150)							

MTCBM0733

Figure 6. Lubrication Chart (M969A1) (Sheet 3 of 3).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

LUBRICATION CHART

SEMITRAILER, TANK: 5000 GAL. BULK HAUL, SELF LOAD/UNLOAD M970A1 (2330-01-155-0047)

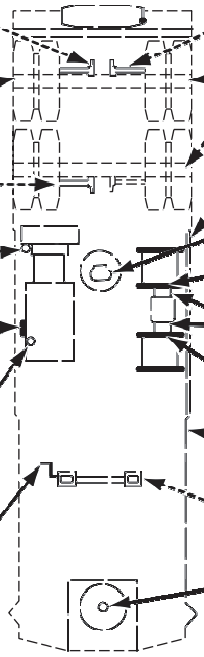
Intervals (on-condition or hard time) and related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all services prescribed for a particular interval. Decrease the intervals if your lubricants are contaminated or if you are operating equipment under adverse conditions, including longer-than-usual operating hours. The intervals may be extended during periods of low activity. If extended, adequate preservation precautions must be taken. Dotted leader lines indicate lubrication is required on both sides of the equipment.

WARNING

Solvent cleaning compound MIL-PRF-680 is toxic and flammable. Always wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and DO NOT breathe vapors. DO NOT use near open flames or excessive heat. The solvent's flash point is 100°F-138°F (38°C-59°C). If you become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts eyes, immediately wash your eyes and get medical aid.

The lowest level of maintenance authorized to lubricate a point is indicated in parentheses by use of the following: (C) Operator or (F) Field Maintenance. Clean all fittings and area around lubrication points with cleaning solvent MIL-PRF-680 or equivalent before lubricating equipment. After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.

		LUBRICANT	INTERVAL
N Fig. 18	Slack Adjuster (F) (Front and rear axles)	GAA	M
Q Fig. 19	Brake Shoe Roller (F) (Front and rear axles)	PL	S
P Fig. 19	Brake Anchor Pin (F) (Front and rear axles)	GAA	S
H Fig. 14	Centrifugal Pump (F) (Remove pipe plug and fill to bottom of pipe plug hole)	OE/HDO	W
F Fig. 12	Engine Oil Drain (F) (Remove drain plug. Refill capacity 6 quarts. Add 1 pint for filter.) (Onan)	OE/HDO	H
E Fig. 12	Engine Crankcase Fill and Level (F) (Check level) (Onan)	OE/HDO	W
C Fig. 12	Landing Gear Handle (C)	OE/HDO	W



		INTERVAL	LUBRICANT
R Fig. 20	Camshaft Bearings (F) (Front and rear axles)	M	GAA
T Fig. 21	Wheel Bearings (8) (F) (Every 12,000 miles or annually inspect.)	A/T	GAA
M Fig. 17	Cabinet Door Hinges and Latches (C)	W	OE/HDO
B Fig. 11	Manhole Hinges (C)	W	OE/HDO
K Fig. 16	Hose Reel Side Bearings (C)	W	OE/HDO
L Fig. 16	Hose Reel Hand Crank Operating Shaft (C)	W	GAA
K Fig. 16	Hose Reel Side Bearings (C)	W	OE/HDO
V Fig. 23	Control Panel Cover Hinge and Latch (C)	W	OE/HDO
D Fig. 12	Landing Gear Footpads (C)	W	OE/HDO
G Fig. 13	Pick-up and Kingpin (C)	W	GAA

TOTAL MAN-HR	
INTERVAL	MAN-HR
A	1.0
W	0.6
M	0.4

TOTAL MAN-HR	
INTERVAL	MAN-HR
S	0.4
H (100)	0.3

MTCBM0737

Figure 7. Lubrication Chart (M970A1) (Sheet 1 of 3).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

LUBRICATION CHART

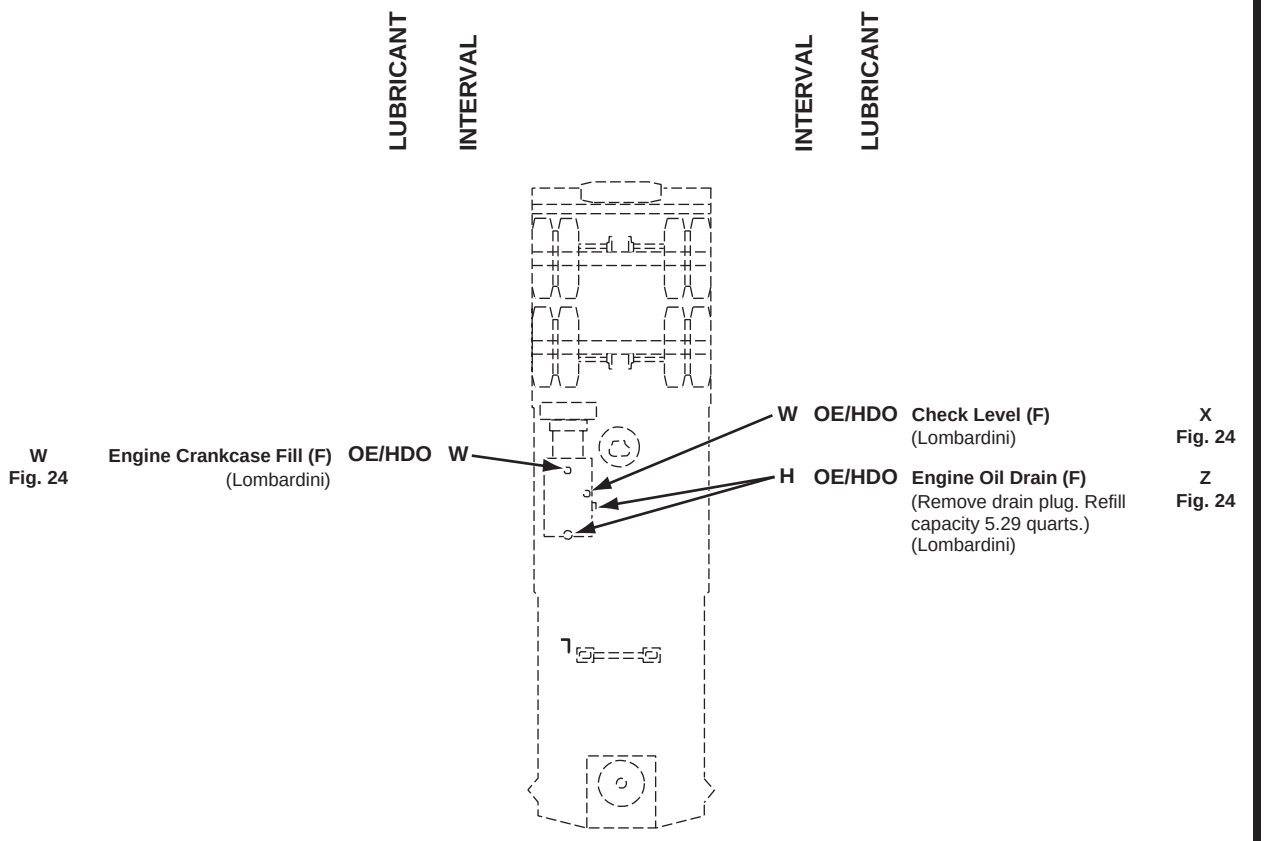
SEMITRAILER, TANK: 5000 GAL. BULK HAUL, SELF LOAD/UNLOAD M970A1 (2330-01-155-0047)

Intervals (on-condition or hard time) and related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all services prescribed for a particular interval. Decrease the intervals if your lubricants are contaminated or if you are operating equipment under adverse conditions, including longer-than-usual operating hours. The intervals may be extended during periods of low activity. If extended, adequate preservation precautions must be taken. Dotted leader lines indicate lubrication is required on both sides of the equipment.

WARNING

Solvent cleaning compound MIL-PRF-680 is toxic and flammable. Always wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and DO NOT breathe vapors. DO NOT use near open flames or excessive heat. The solvent's flash point is 100°F-138°F (38°C-59°C). If you become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts eyes, immediately wash your eyes and get medical aid.

The lowest level of maintenance authorized to lubricate a point is indicated in parentheses by use of the following: (C) Operator or (F) Field Maintenance. Clean all fittings and area around lubrication points with cleaning solvent MIL-PRF-680 or equivalent before lubricating equipment. After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.



TOTAL MAN-HR		TOTAL MAN-HR	
INTERVAL	MAN-HR	INTERVAL	MAN-HR
W	0.6	H (100)	0.3

MTCBM0738

Figure 8. Lubrication Chart (M970A1) (Sheet 2 of 3).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

KEY

LUBRICANT		REFILL CAPACITY (APP)	EXPECTED TEMPERATURE				INTERVAL
			Above 32°	40°F to -10°F	0°F to -55°F		
OE/HDO (MIL-L-2104)	Lubricating oil internal combustion engine.					For Arctic Operation, Refer to FM 9-207	D - Daily W - Weekly M - Monthly S - Semiannually A - Annually H - Hours
or			OE/HDO-30	OE/HDO-20	OEA		
OEA (MIL-L-46167)	Engine crankcase (Onan)	6 quarts, plus 1 pint for oil filter					
	Engine crankcase (Lombardini)	5.29 quarts					
GAA (MIL-G-10924)	Grease, Automotive and artilery	as req'd	All Temperature				
PL (PL-S-VV-L-800)	Preservative oil		PL - Medium	PL - Special	PL - Special		
or							
PL (PL-M-MIL-L-3150)							

MTCBM0739

Figure 9. Lubrication Chart (M970A1) (Sheet 3 of 3).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

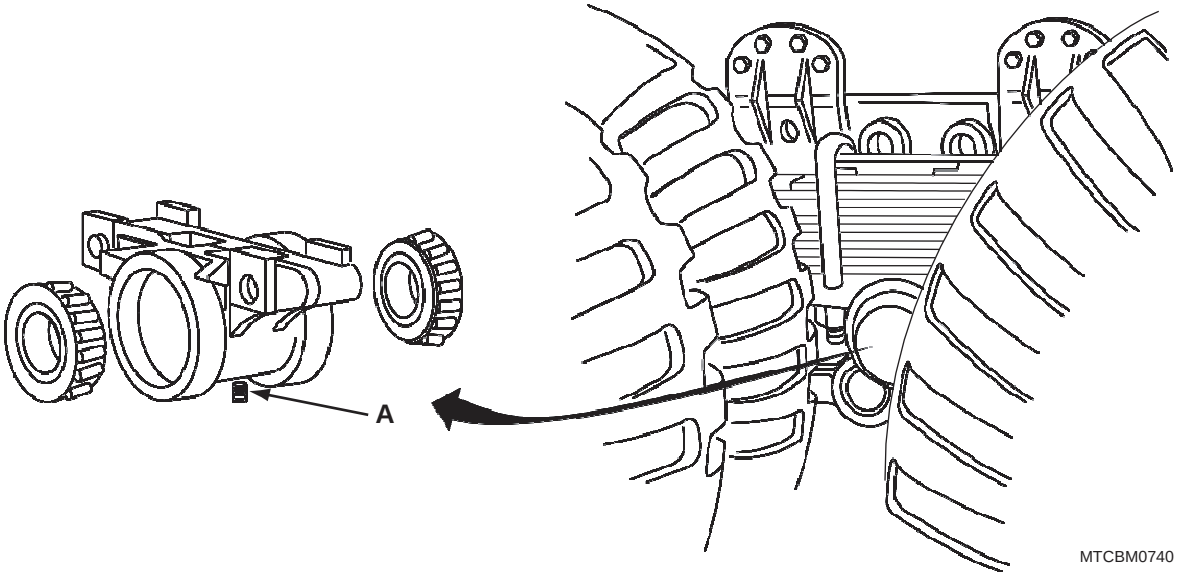


Figure 10. Spring Seat Bearings Lubrication Points.

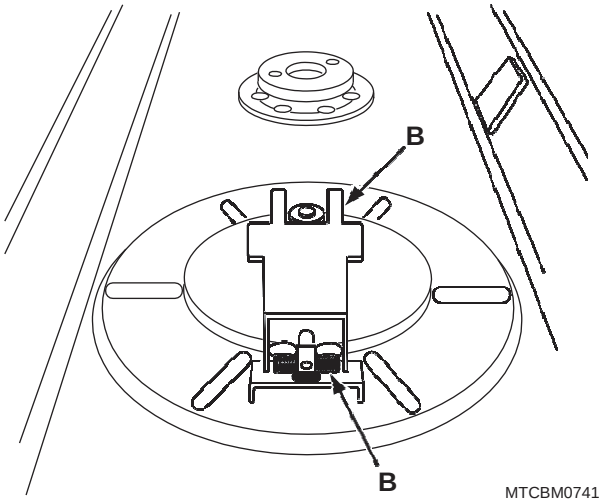


Figure 11. Manhole Hinges Lubrication Points.

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

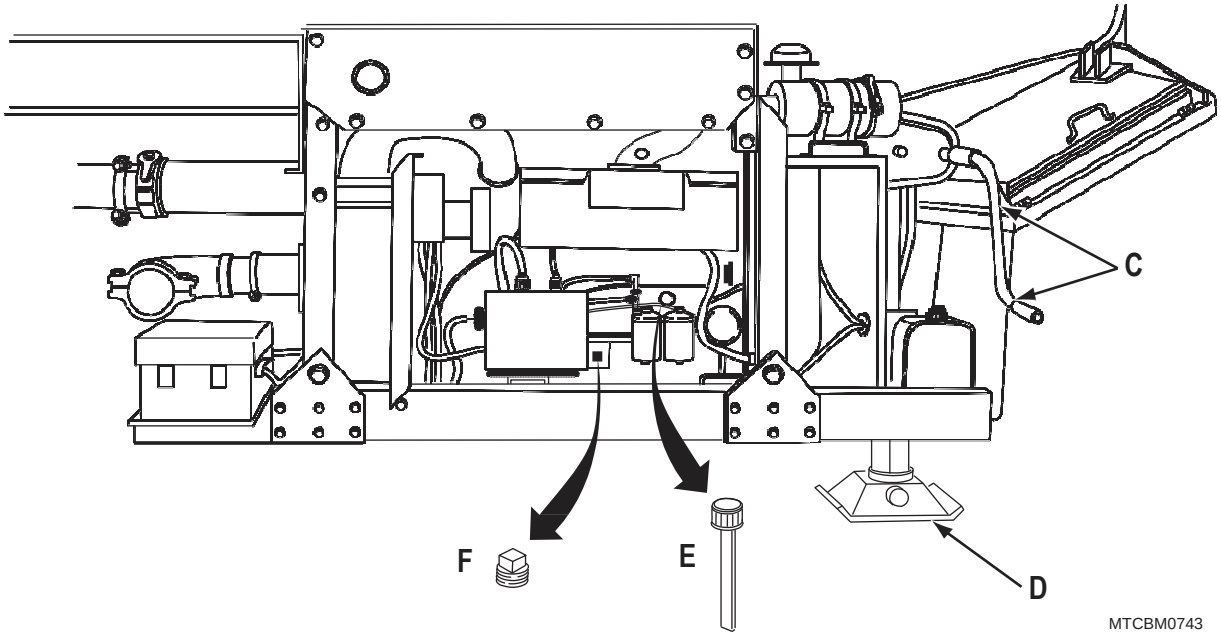


Figure 12. Engine and Landing Gear Lubrication Points.

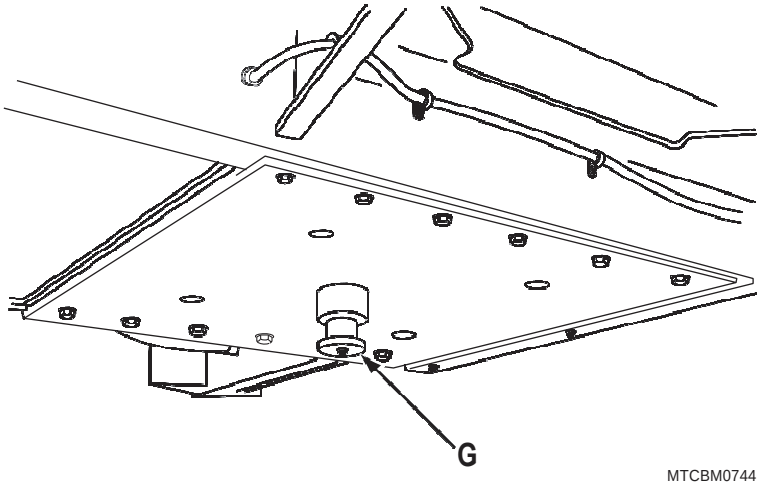


Figure 13. Kingpin (Upper Coupler) Plate Lubrication Points.

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

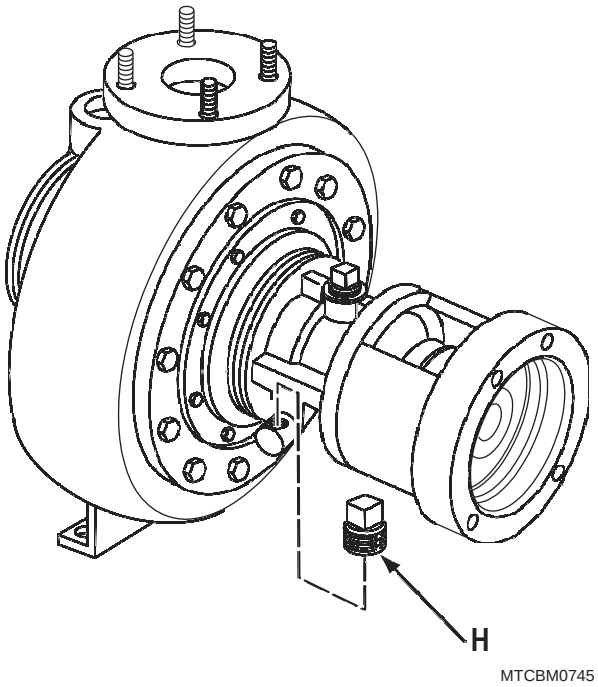


Figure 14. Centrifugal Pump Location.

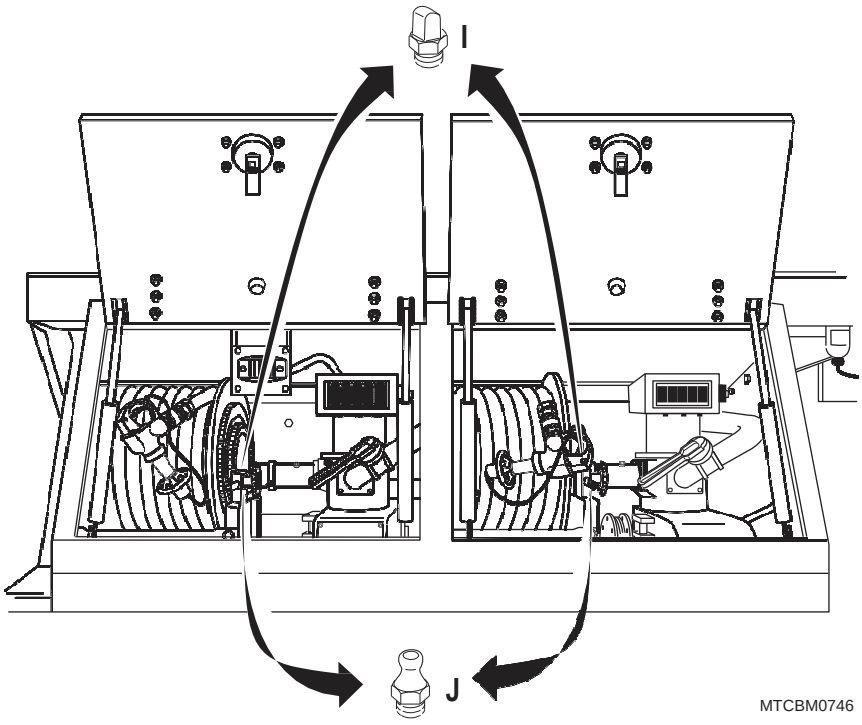


Figure 15. Hose Reel Handcrank and Hose Reel Side Bearings Lubrication Points (M969A1).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

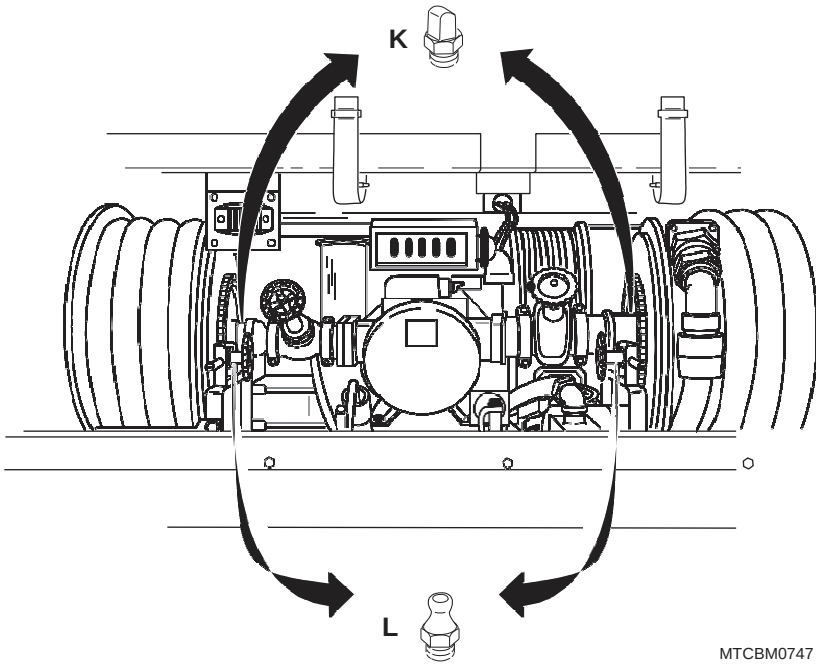


Figure 16. Hose Reel Handcrank and Hose Reel Side Bearings Lubrication Points (M970A1).

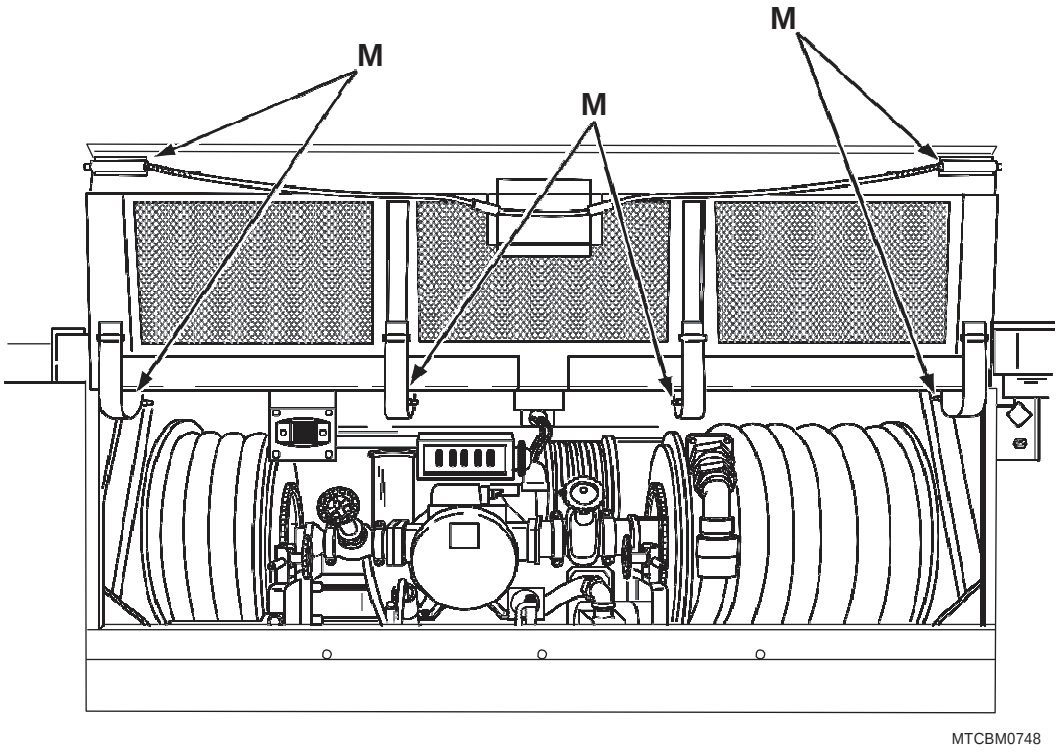


Figure 17. Cabinet Door Hinges and Latches (M970A1).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

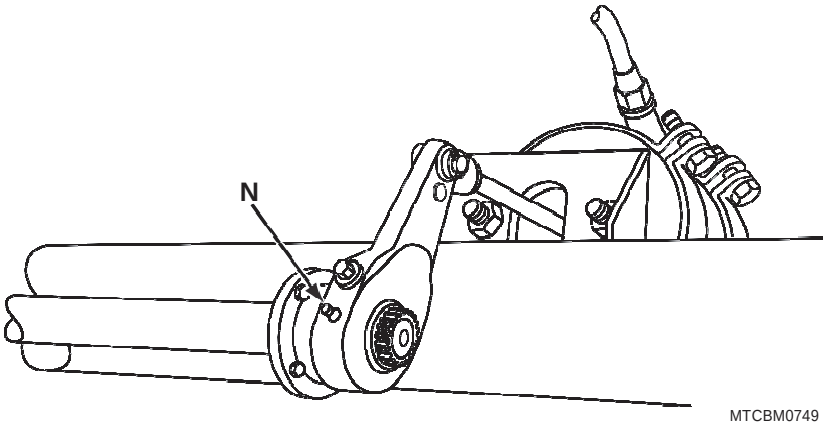


Figure 18. Lubrication Fittings for Slack Adjuster (M967A1, M969A1, and M970A1).

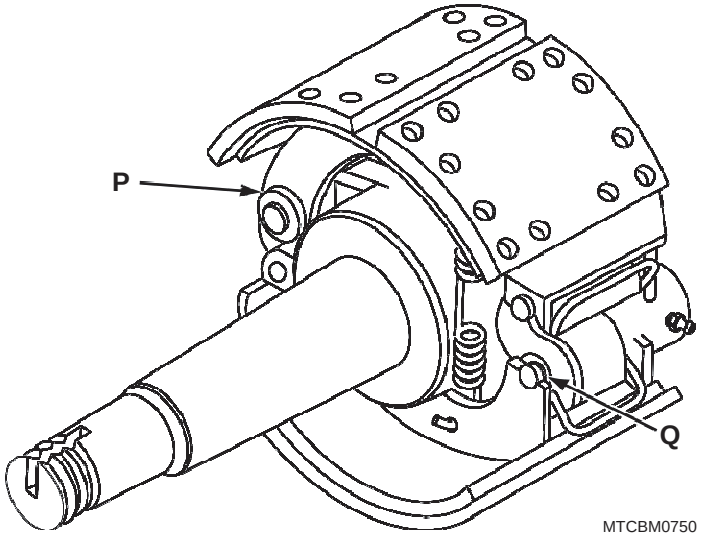


Figure 19. Brake Shoe Roller and Brake Anchor Pin.

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

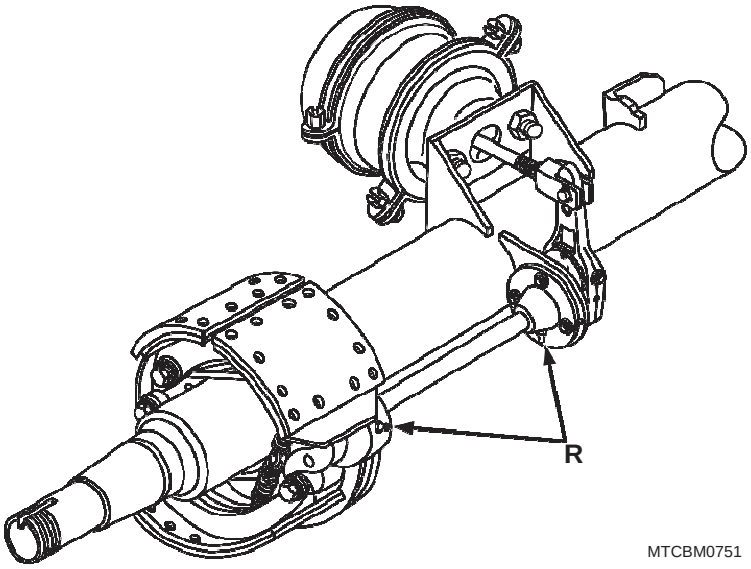


Figure 20. Lubrication Fittings for S-Cam (M967A1, M969A1, and M970A1).

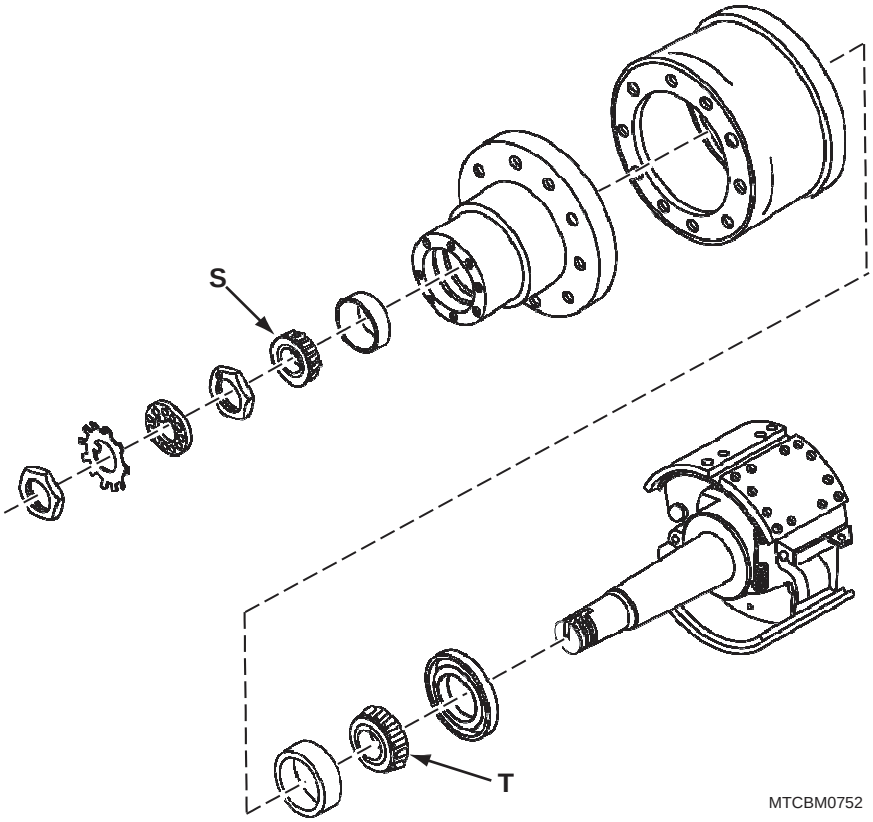


Figure 21. Inner and Outer Wheel Bearing Lubrication (M967A1, M969A1, and M970A1).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

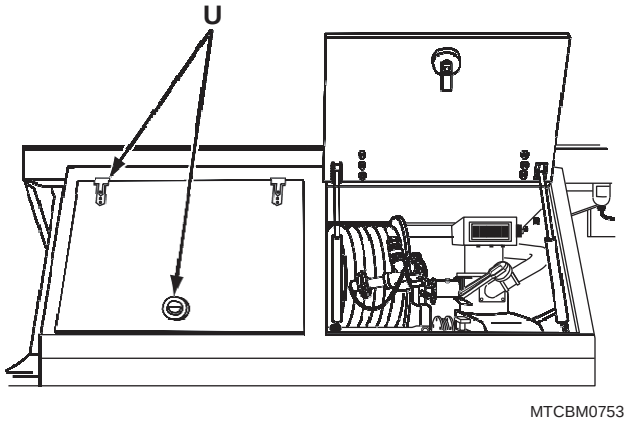


Figure 22. Hose Reel Cabinet Door Hinges and Latches (M969A1).

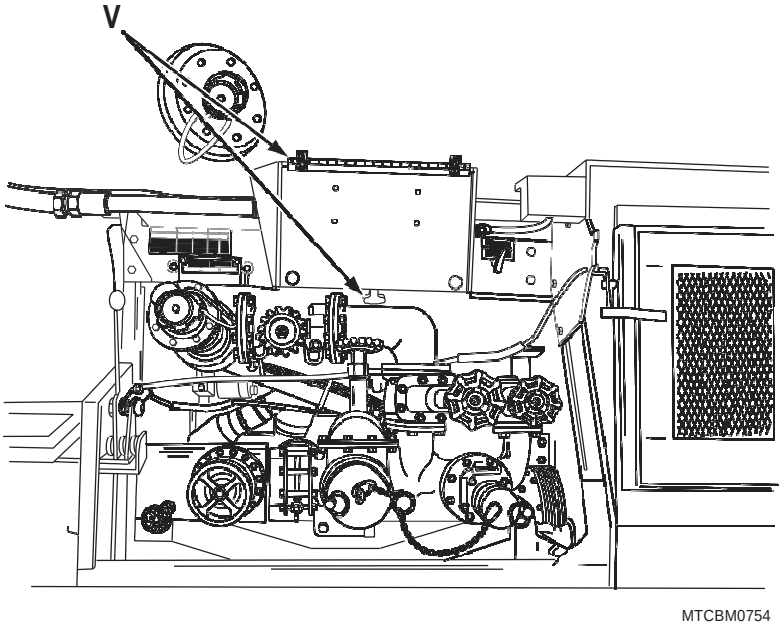


Figure 23. Control Panel Cover Hinges and Latches (M967A1, M969A1, and M970A1).

SPECIFIC LUBRICATION INSTRUCTIONS - Continued

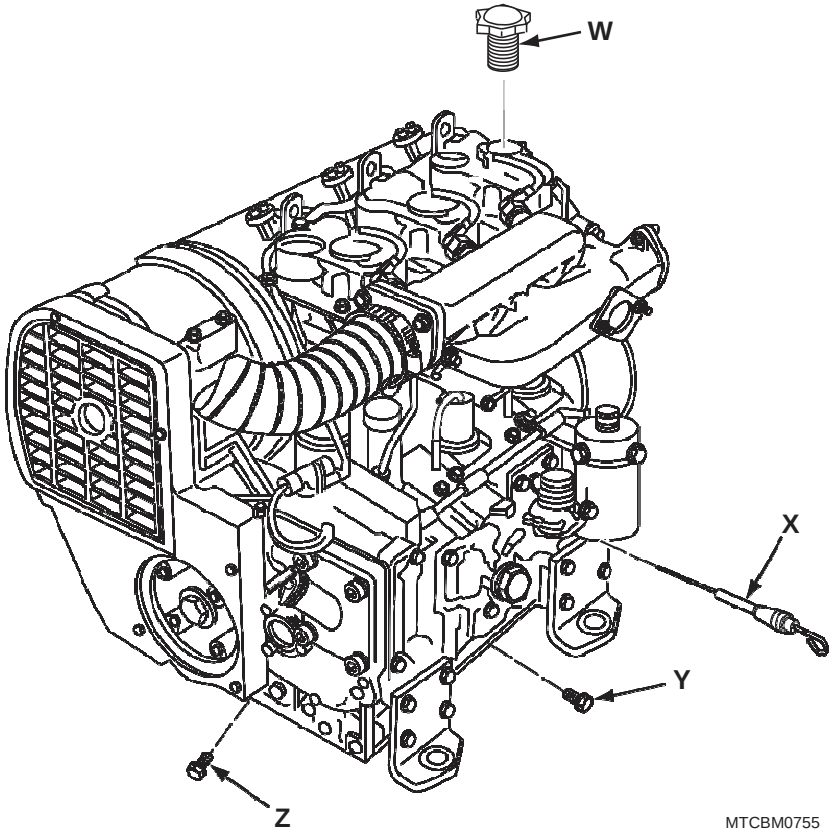


Figure 24. Engine Oil Drain, Fill, and Level Check (Lombardini).

END OF WORK PACKAGE

FIELD MAINTENANCE
TORQUE LIMITS

SCOPE

This section provides general torque limits for screws used on the semitrailer. Special torque limits are indicated in the maintenance procedures for applicable components. The general torque limits given in this appendix shall be used when specific torque limits are not indicated in the maintenance procedure. These general torque limits cannot be applied to screws that retain rubber components. The rubber components will be damaged before the correct torque limit is reached. If a special torque limit is not given in the maintenance instructions, tighten the screw or nut until it touches the metal bracket, then tighten it one more turn.

TORQUE LIMITS

Dry torque limits are used on screws that do not have lubricants applied to threads. Wet torque limits are used on screws that have high-pressure lubricants applied to threads.

How to Use Torque Tables.

1. Measure the diameter of the screw you are installing.
2. Count the number of threads per inch or use a pitch gage.
3. Under the heading SIZE, look down the lefthand column until the diameter of screw to be installed is found (there will usually be two lines beginning with the same size).
4. In the second column under SIZE, find the number of threads per inch that matches the number of threads counted in Step 2.
5. To find the grade of the screw that is to be installed, match the markings on the head to the correct picture of CAPSCREW HEAD MARKINGS on the table.
6. Look down the column under the picture found in Step 5 until the torque limit in foot-pounds for the diameter and threads per in. of the screw being installed is found.

TORQUE LIMITS - Continued

Table 1. Torque Limits for Dry Fasteners.

CAPSCREW HEAD MARKINGS										
NOTE Manufacturer's marks may vary. These are all SAE Grade 5 (3 lines).										
SIZE			TORQUE							
			SAE GRADE NO. 1 or 2		SAE GRADE NO. 5		SAE GRADE NO. 6 or 7		SAE GRADE NO. 8	
DIA. IN.	Threads Per in.	mm	FOOT POUNDS	N·m	FOOT POUNDS	N·m	FOOT POUNDS	N·m	FOOT POUNDS	N·m
1/4	20	6.35	5	6.78	8.0	10.85	10	13.56	12	16.27
1/4	28	6.35	6	8.13	10.0	13.56	—	—	14	18.98
5/16	18	7.94	11	14.91	17.0	23.05	19.0	25.76	24	32.54
5/16	24	7.94	13	17.63	19.0	25.76	—	—	27	36.61
3/8	16	9.53	18	24.40	31.0	42.03	34	46.10	44	59.66
3/8	24	9.53	20	27.12	35.0	47.45	—	—	49	66.44
7/16	14	11.11	28	37.96	49.0	66.44	55	74.57	70	94.91
7/16	20	—	30	40.67	55.0	74.57	—	—	78	105.75
1/2	13	12.70	39	52.88	75.0	101.69	85	115.25	105	142.36
1/2	20	—	41	55.59	85.0	115.25	—	—	120	162.70
9/16	12	14.28	51	69.15	110.0	149.14	120.0	162.70	155	210.15
9/16	18	—	55	74.57	120.0	162.70	—	—	170	230.49
5/8	11	15.88	63	85.42	150.0	203.37	167	226.42	210	284.72
5/8	18	—	95	128.80	170.0	230.49	—	—	240	325.40
3/4	10	19.05	105	142.36	270.0	366.07	280	379.63	375	508.43
3/4	16	—	115	155.92	295.0	399.97	—	—	420	596.52
7/8	9	22.23	160	216.96	375.0	536.62	440	596.64	605	820.38
7/8	14	—	175	237.30	435.0	599.85	—	—	675	915.30
1	8	25.40	235	318.66	590.0	800.04	660	694.96	910	1233.96

TORQUE LIMITS - Continued

Table 1. Torque Limits for Dry Fasteners - Continued.

CAPSCREW HEAD MARKINGS										
1	14	—	250	338.00	660.0	894.96	—	—	990	1342.44
1-1/8	—	25.58	—	—	800.0	1064.80	—	—	1280	1735.70
					880.0	1193.20			1444	1952.80
1-1/4	—	31.75	—	—	—	—	—	—	1820	2467.90
									2000	2712.00
1-3/8	—	34.93	—	—	1460.0	1979.80	—	—	2300	3227.30
					1680.0	2278.10			2720	3688.30
1-1/2	—	38.10	—	—	1940.0	2630.60	—	—	3160	4285.0
					2200.0	2963.20			3560	4827.40

Table 2. Torque Limits for Wet Fasteners.

CAPSCREW HEAD MARKINGS										
SIZE			TORQUE							
			SAE GRADE NO. 1 or 2		SAE GRADE NO. 5		SAE GRADE NO. 6 OR 7		SAE GRADE NO. 8	
DIA. IN.	Threads Per in.	mm	FOOT POUNDS	N·m	FOOT POUNDS	N·m	FOOT POUNDS	N·m	FOOT POUNDS	N·m
1/4	20	6.35	4.9	6.10	7.2	9.76	9	12.00	10.8	14.64
1/4	28	6.35	5.4	7.33	9.0	12.20	—	—	12.6	17.08
5/16	18	7.94	9.9	13.34	15.3	22.54	17.1	23.18	21.6	29.27
5/16	24	7.94	11.7	15.87	17.1	23.18	—	—	24.3	32.95
3/8	16	9.53	16.2	21.97	27.9	37.84	30.6	41.49	39.6	53.69
3/8	24	9.53	18.0	24.41	31.5	42.71	—	—	44.1	59.80
7/16	14	11.11	25.2	34.17	44.1	59.80	49.5	67.12	63.0	85.42
7/16	20	—	27.0	36.61	49.5	67.12	—	—	70.2	95.19
1/2	13	12.70	35.1	47.58	67.5	91.53	76.5	103.73	94.5	128.14

TORQUE LIMITS - Continued

Table 2. Torque Limits for Wet Fasteners - Continued.

1/2	20	—	36.9	50. 4	76.5	103.73	—	—	106.0	146.50
9/16	12	14.28	45.9	62.24	99.0	134.24	108.0	146.45	139.5	189.16
9/16	18	—	45.5	67.12	106.0	146.45	—	—	153.0	207.47
5/8	11	15.88	56.7	76.89	135.0	183.06	150.3	203.8	189.0	256.28
5/8	18	—	85.5	115.94	153.0	204.47	—	—	216.0	296.90
3/4	10	19.05	37.5	128.14	243.0	329.51	252.0	341.71	337.5	457.65
3/4	16	—	103.5	140.25	265.5	360.20	—	—	378.0	536.87
7/8	9	22.23	144.0	195.25	355.5	482.06	396.0	536.98	544.5	738.34
7/8	14	—	157.5	215.57	391.5	530.87	—	—	607.5	823.77
1	8	25.40	211.5	286.79	531.0	720.04	594.0	805.46	819.0	1110.56
1	14	—	225.0	305.10	594.0	805.46	—	—	891.0	1208.20
1-1/8	—	25.58	—	—	720.0	976.32	—	—	1152.0	1562.13
					792.0	1073.97			1296.0	1757.52
1-1/4	—	31.75	—	—	—	—	—	—	1638.0	2221.11
									1800.0	2440.80
1-3/8	—	34.93	—	—	1314.0	1781.82	—	—	2142.0	2904.57
					1512.0	2050.29			2448.0	3319.47
1-1/2	—	38.10	—	—	1746.0	2367.54	—	—	2844.0	3856.50
					1980.0	2684.88			3204.0	4344.66

TORQUE LIMITS - Continued

When torquing a fastener, select a torque wrench whose range (Table 1) fits the required torque value. A torque wrench is most accurate from 25 percent to 75 percent of its stated range. A torque wrench with a stated range of 0 to 100 will be most accurate from 25 to 75 foot-pounds. The accuracy of readings will decrease as you approach 0 foot-pounds or 100 foot-pounds. The ranges in Table 1 are based on this principle.

Table 3. Torque Ranges.

STATED RANGE	MOST EFFECTIVE RANGE
0-600 lb ft (0-813 N·m)	150-450 lb ft (203-610 N·m)
0-170 lb ft (0-230 N·m)	42.5-127.5 lb ft (58-173 N·m)
15-75 lb ft (20-102 N·m)	18.8-56.3 lb ft (25-76 N·m)

Threaded fasteners are categorized according to diameter of the fastener shank. Thread styles are divided into broad groups, the two most common being coarse (Unified Coarse-UNC) and fine (Unified Fine-UNF). These groups are defined by the number of threads per in. on the bolt shanks. In addition, threads are categorized by thread class (Table 1), which is a measure of the degree between threads of bolt or screw (external threads) and threads of the attaching nut or tapped hole (internal threads). The most common thread class for bolts and screws is Class 2.

Table 4. Threaded Classes and Description.

EXTERNAL	INTERNAL	INTERNAL
1A	1B	LOOSE FIT
2A	2B	MEDIUM FIT
3A	3B	CLOSE FIT

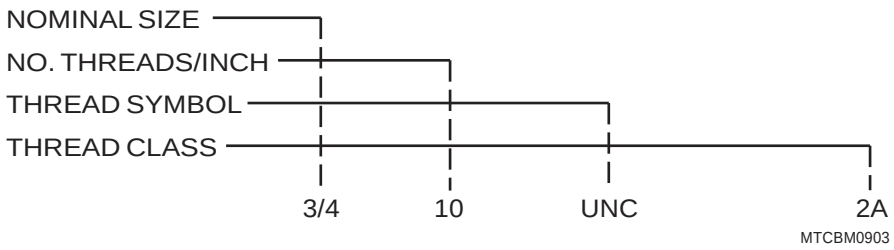


Figure 1. Fastener Description.

TORQUE LIMITS - Continued

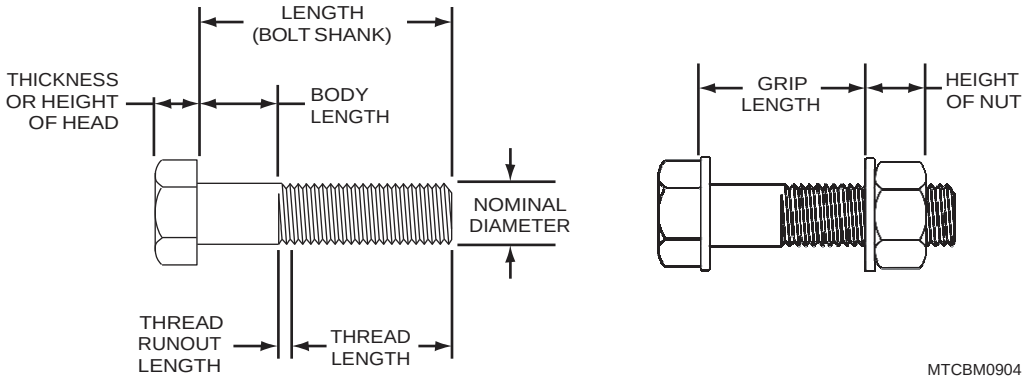


Figure 2. Fastener Illustration.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ENHANCED SCHEMATICS

INITIAL SETUP:

Not Applicable

INTRODUCTION

This work package contains schematic drawings of the vehicle electrical systems and repairable wiring harnesses, brake system schematics, and flow diagrams for the tankers. Schematics for each wiring harness, cable assembly, or lead assembly are identified by part numbers. Refer to the vehicle system schematic when performing troubleshooting for electrical problems. Refer to the wiring harness, cable assembly, or lead assembly schematic during disassembly.

ELECTRICAL SYSTEM SCHEMATICS

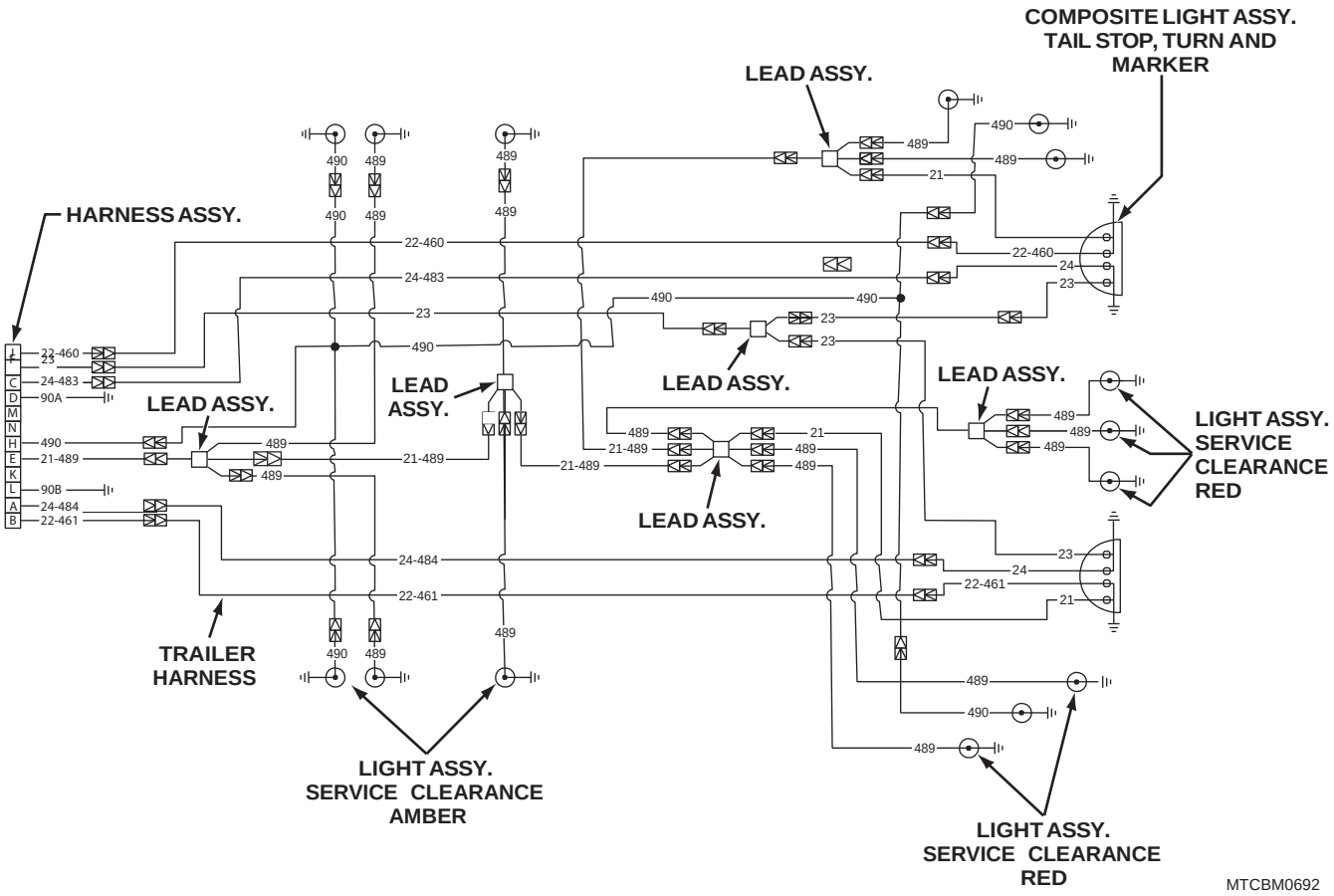


Figure 1. Chassis Wiring Diagram.

ELECTRICAL SYSTEM SCHEMATICS - Continued

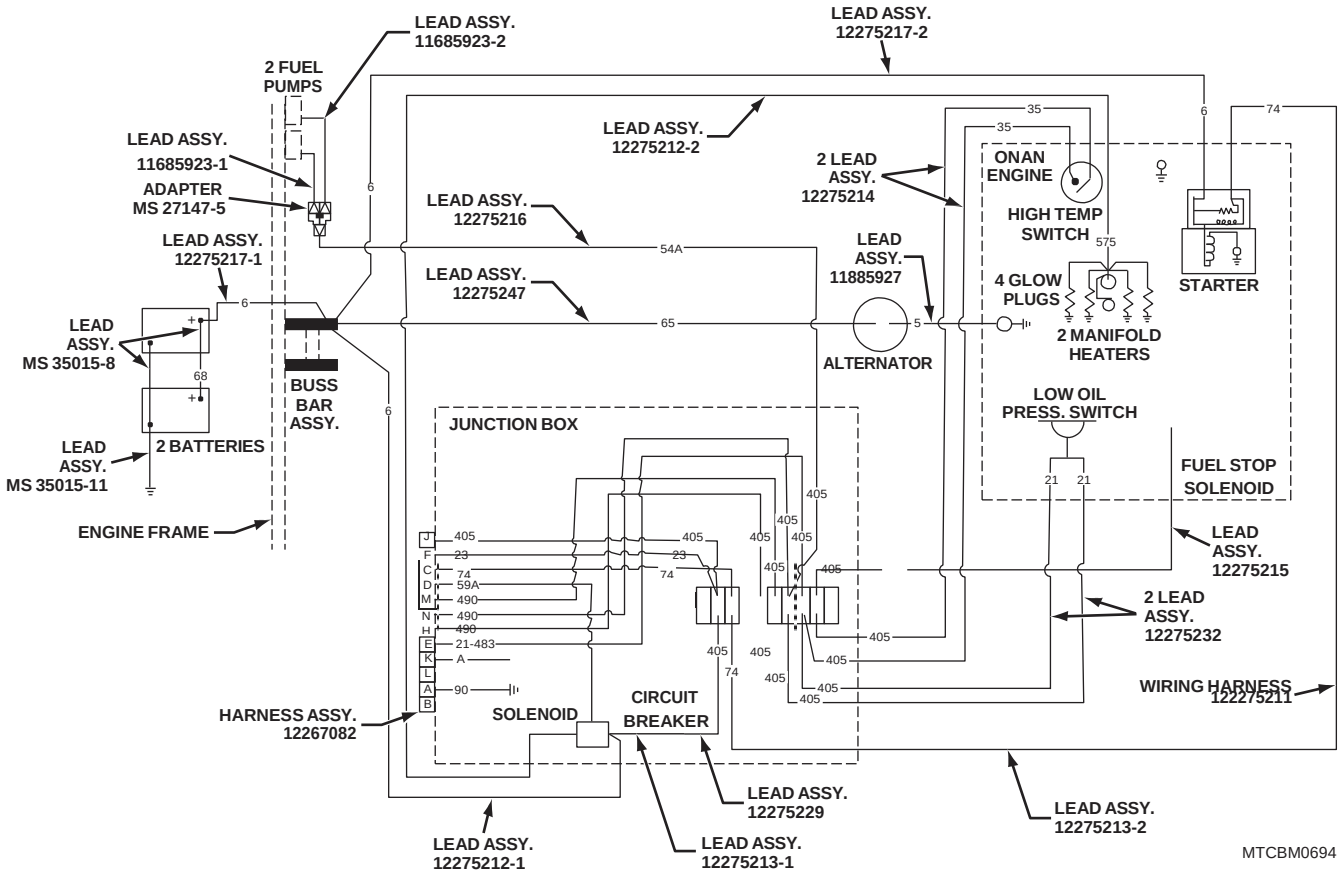


Figure 2. Engine Wiring Schematic.

ELECTRICAL SYSTEM SCHEMATICS - Continued

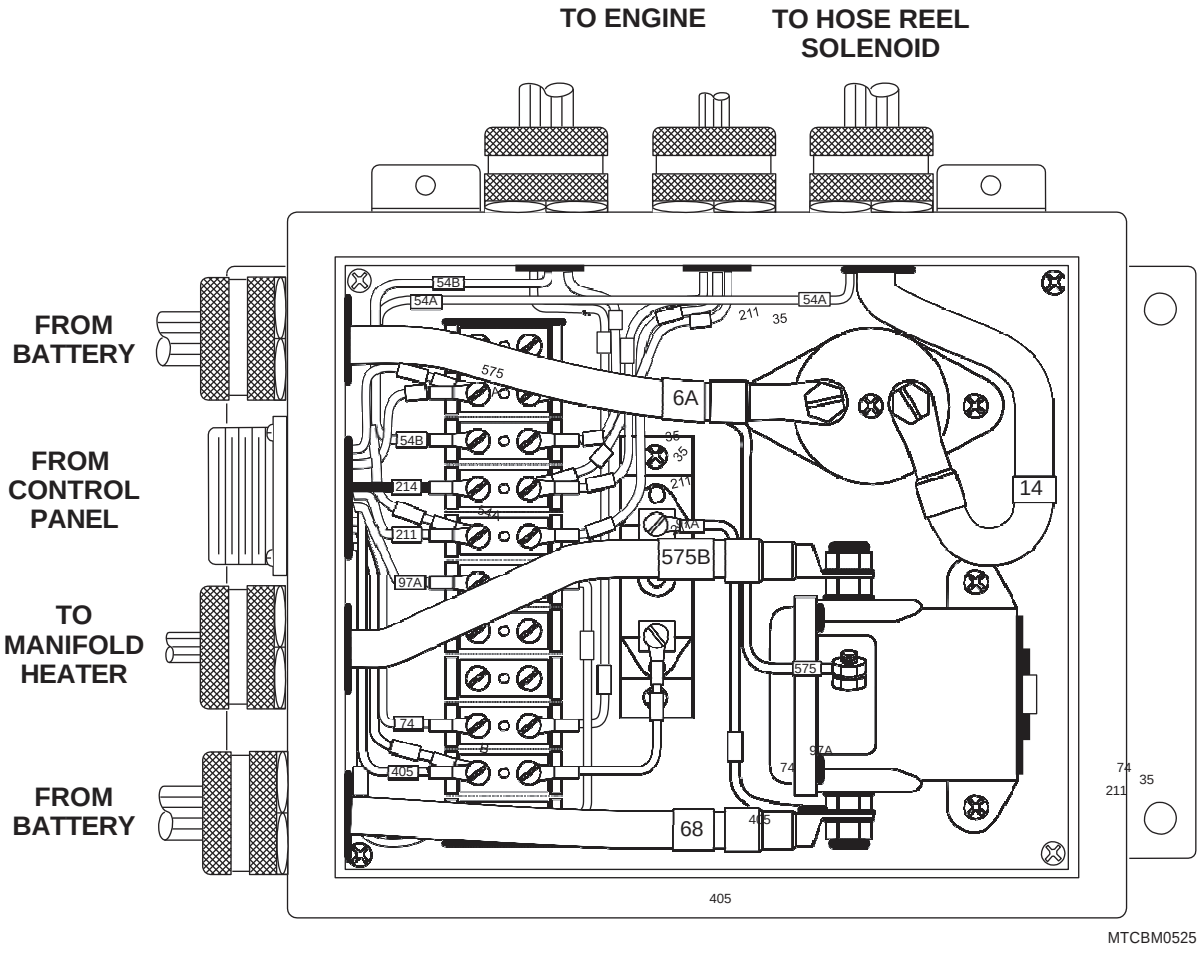


Figure 3. Wiring Junction Box.

ELECTRICAL SYSTEM SCHEMATICS - Continued

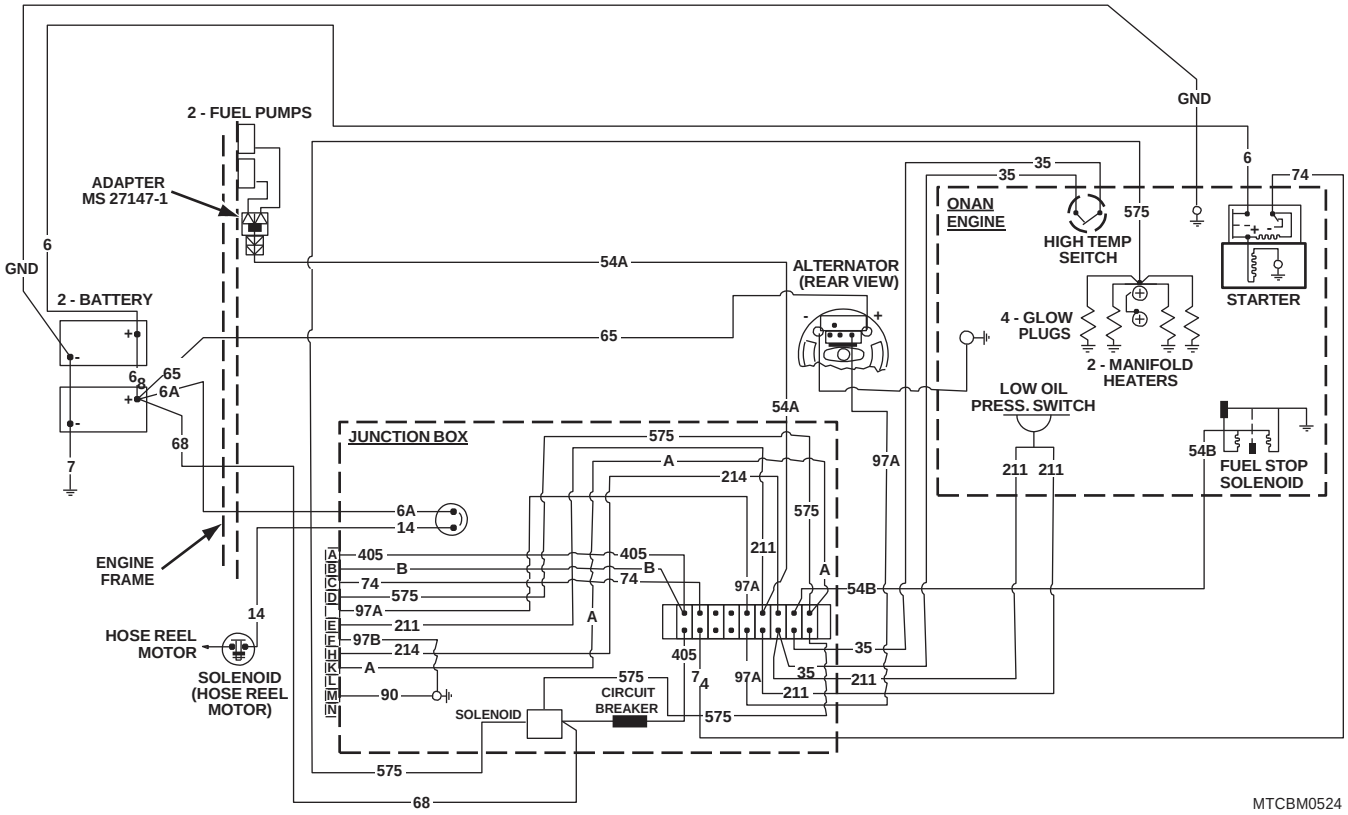


Figure 4. EPA Version.

ELECTRICAL SYSTEM SCHEMATICS - Continued

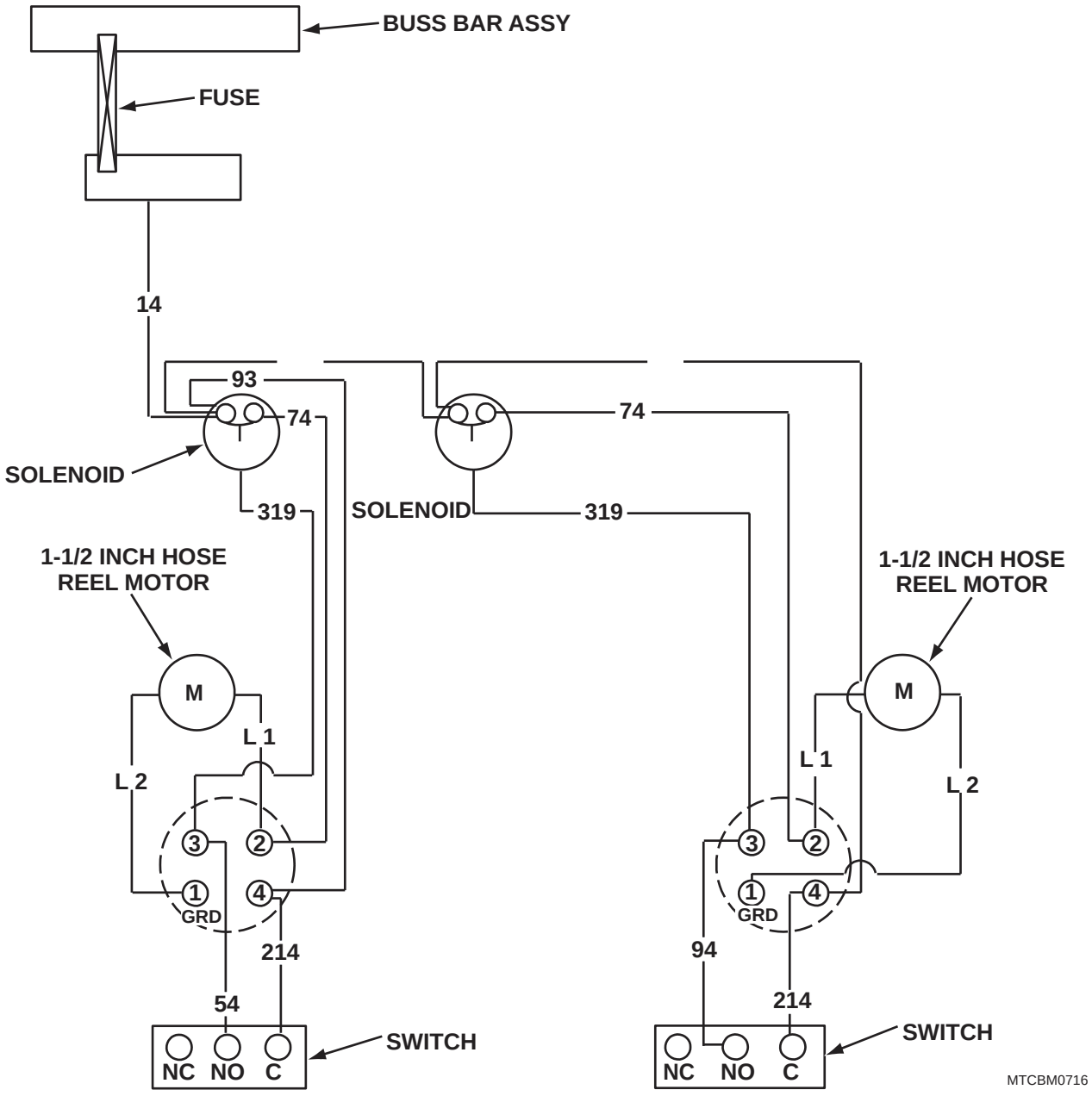


Figure 5. Hose Reel Wiring Diagram (M969A1).

ELECTRICAL SYSTEM SCHEMATICS - Continued

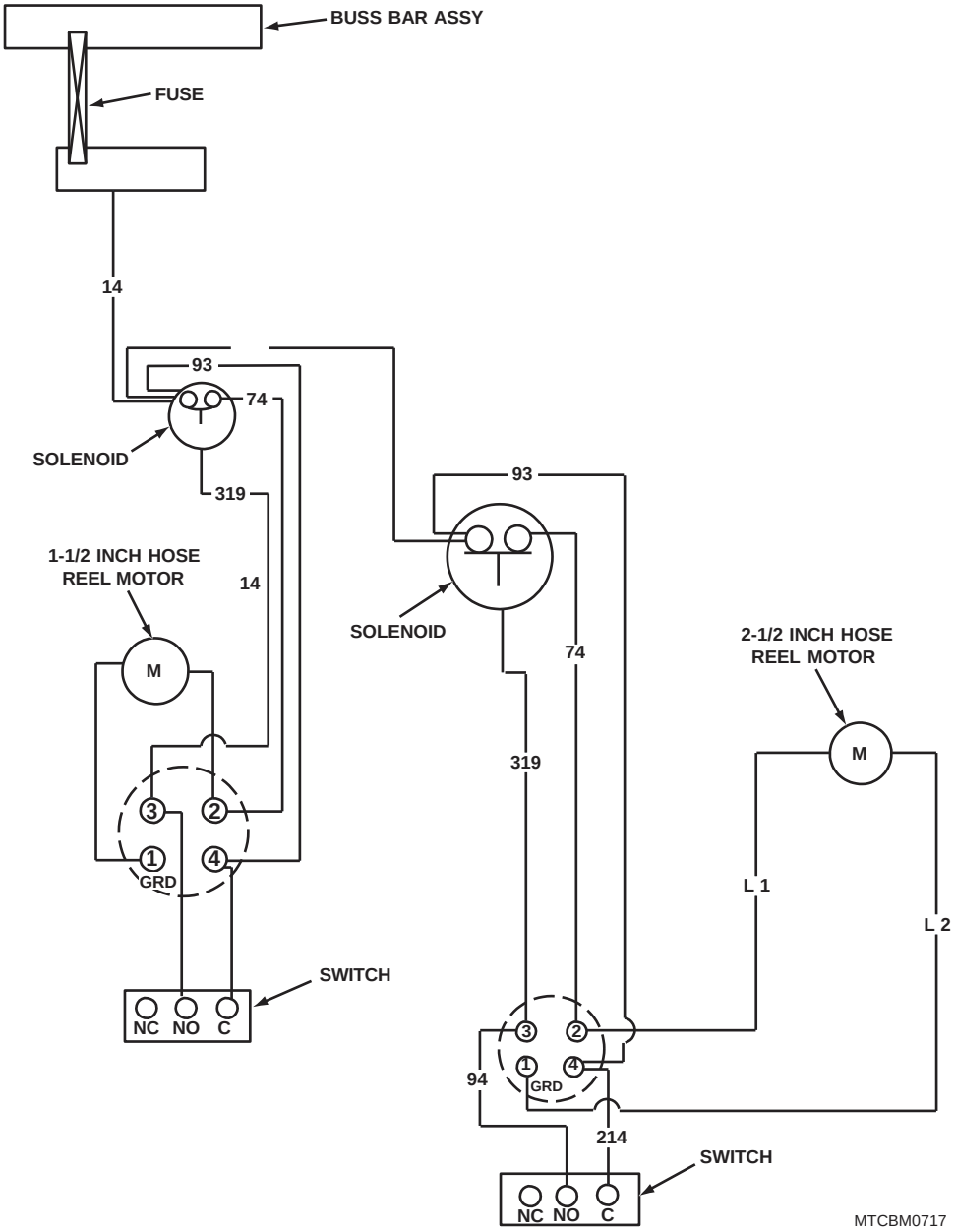


Figure 6. Hose Reel Diagram (M970A1).

AIR SYSTEM SCHEMATICS

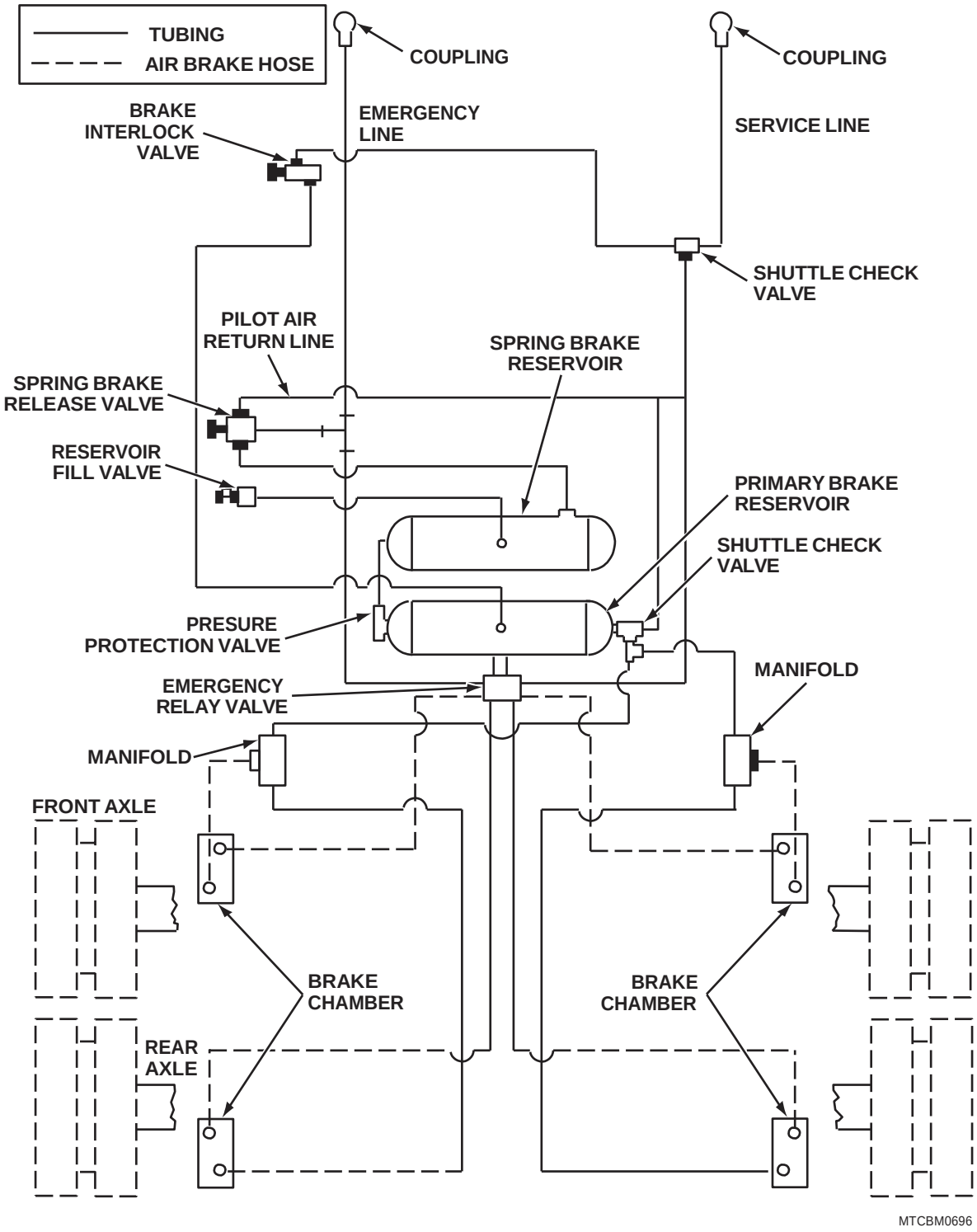


Figure 7. Brake Schematic (M967A1, M969A1, and M970A1).

AIR SYSTEM SCHEMATICS - Continued

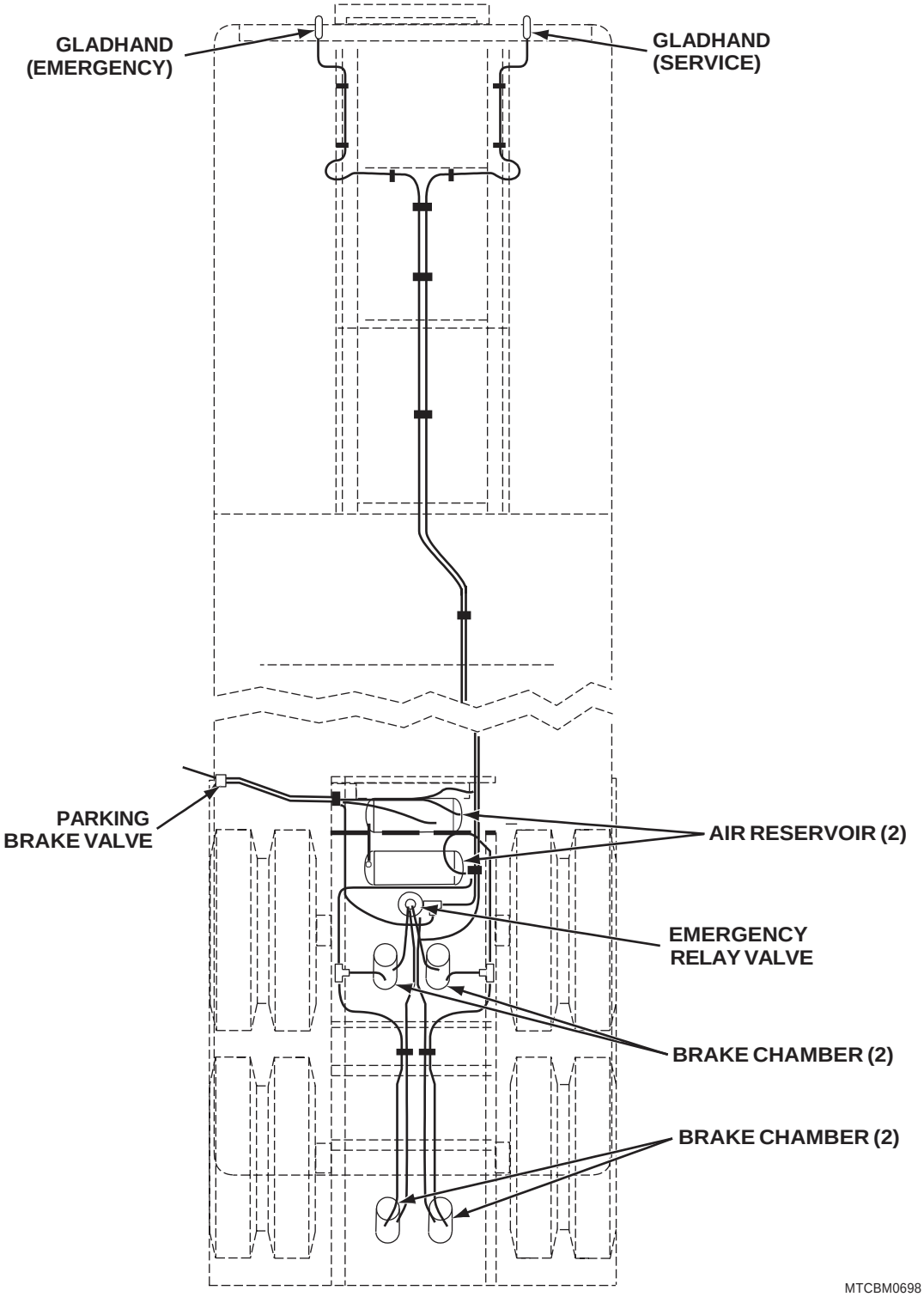


Figure 8. Air Brake Schematic (M967A1, M969A1, and M970A1).

AIR SYSTEM SCHEMATICS - Continued

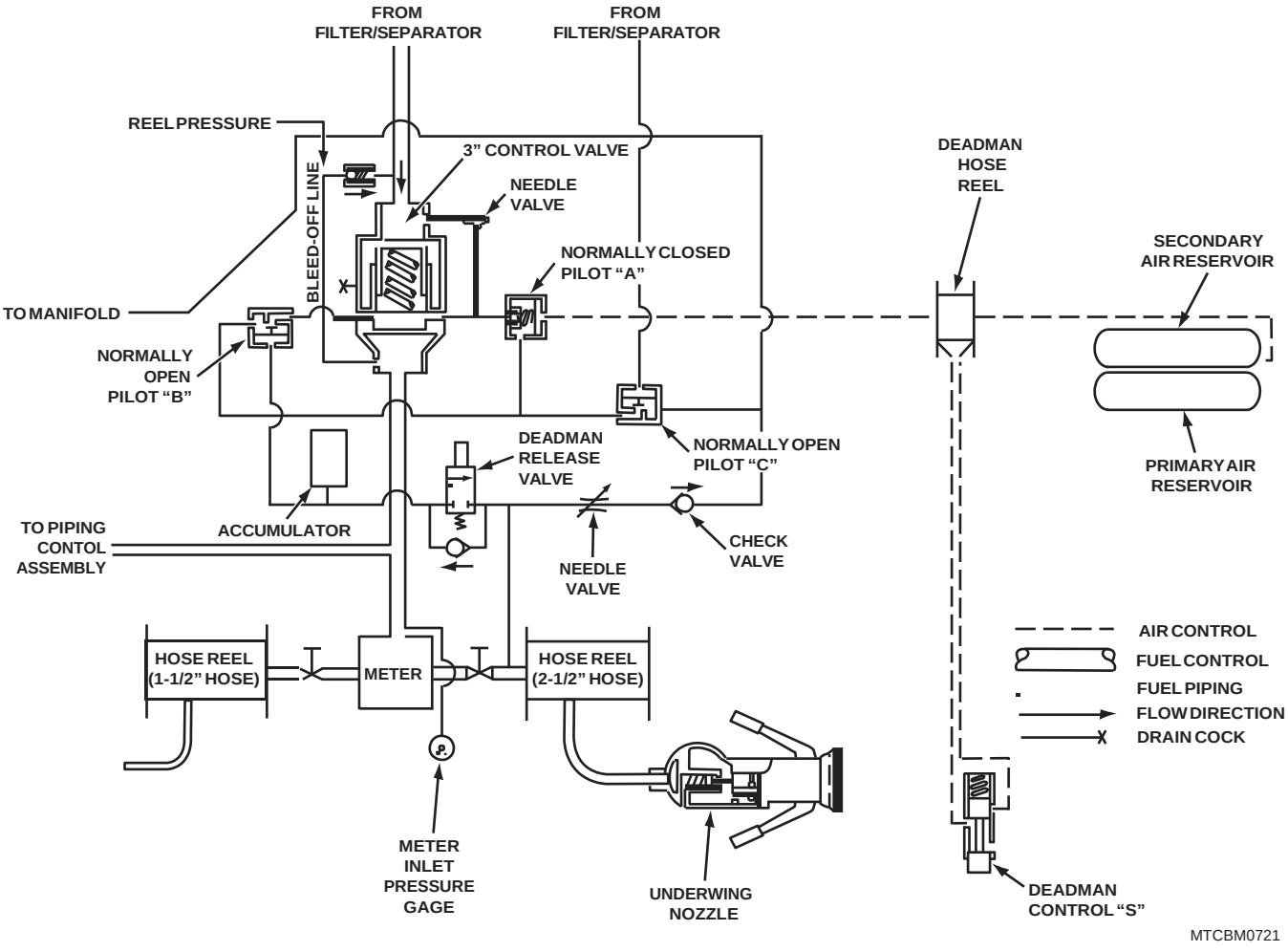


Figure 9. Deadman Control System Schematic (M970A1).

FUEL FLOW SCHEMATICS

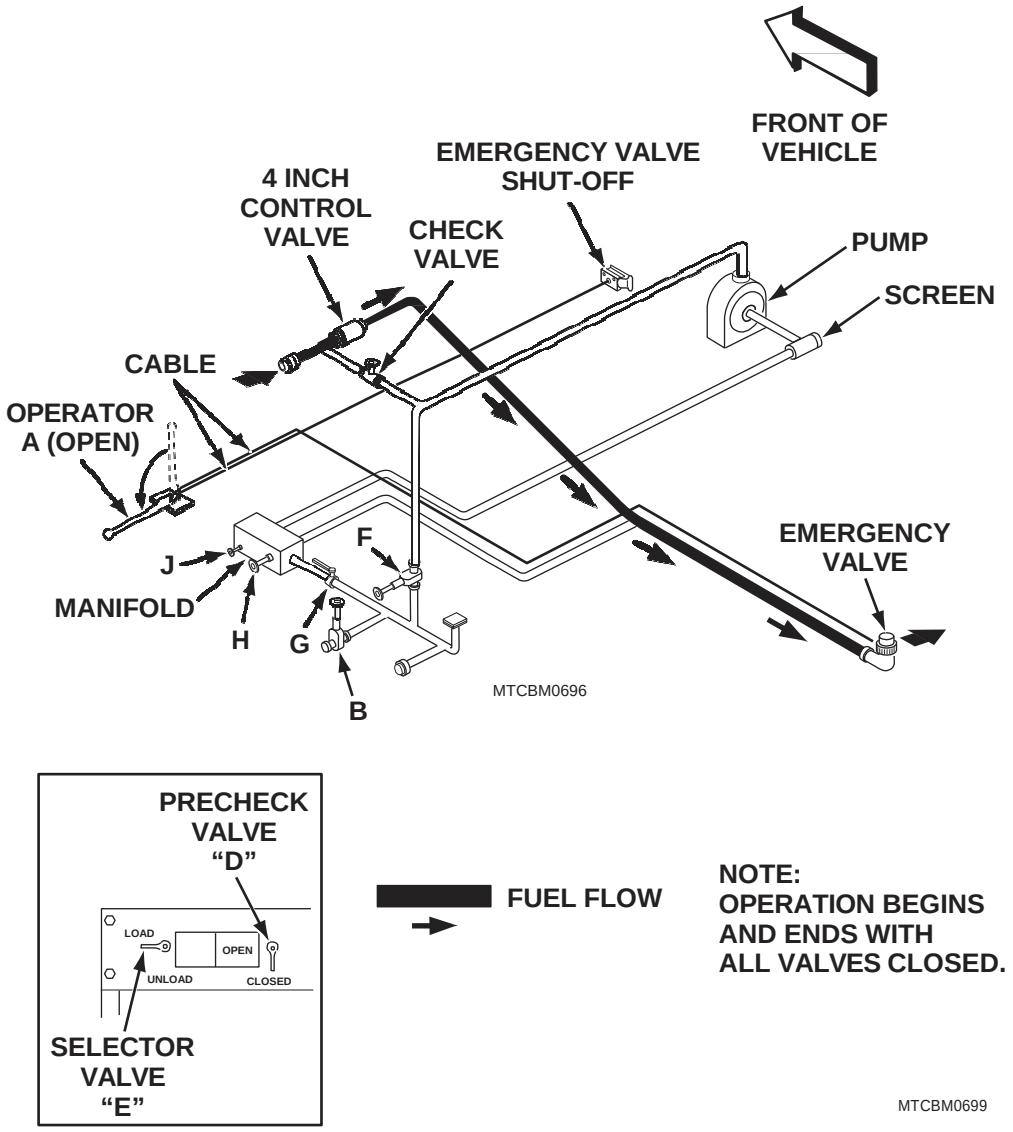


Figure 10. Typical Bottom Loading Flow Diagram, All Models (M970A1 Shown).

FUEL FLOW SCHEMATICS - Continued

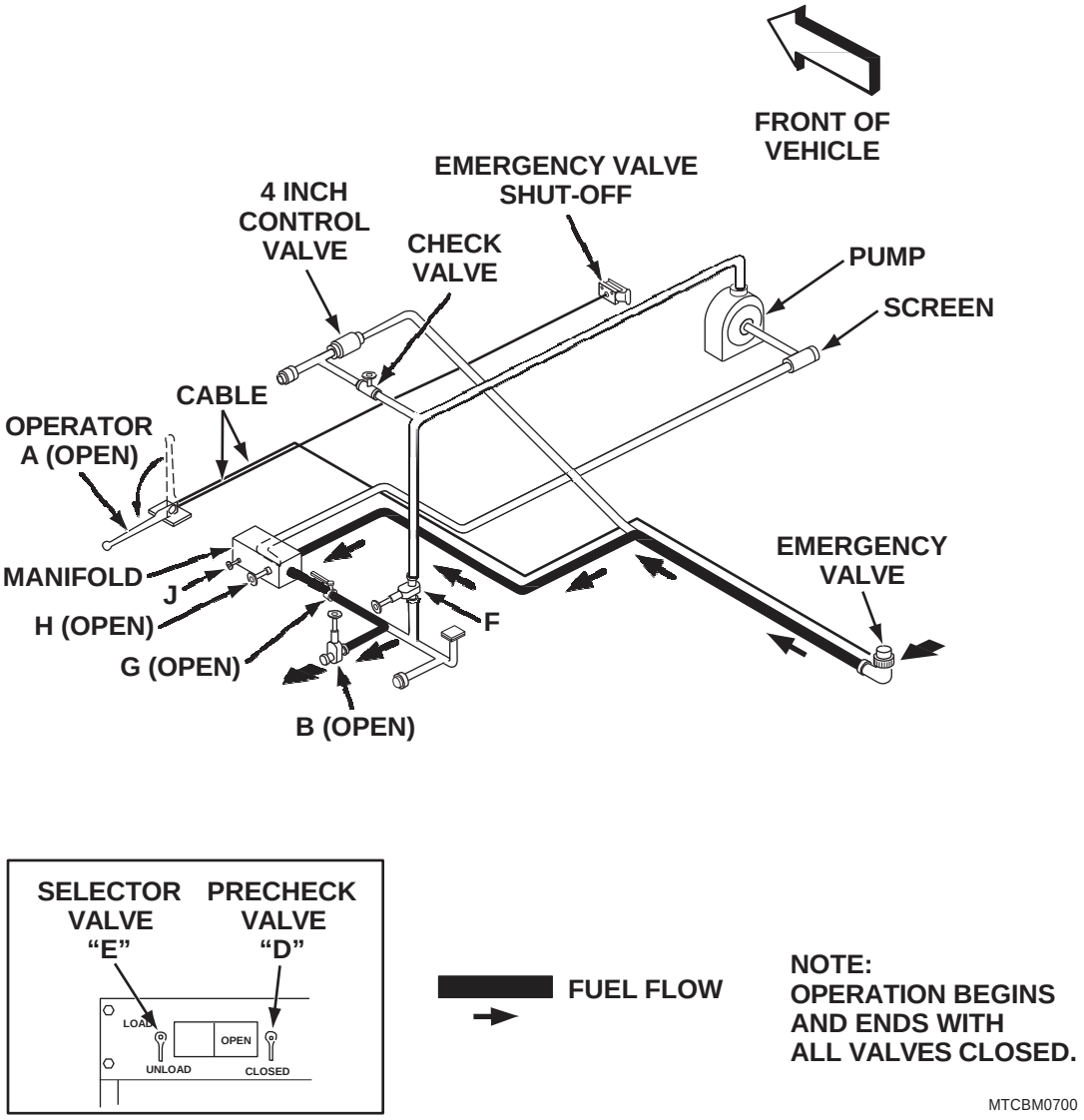


Figure 11. Typical Gravity Unloading Flow Diagram, All Models (M967A1 Shown).

FUEL FLOW SCHEMATICS - Continued

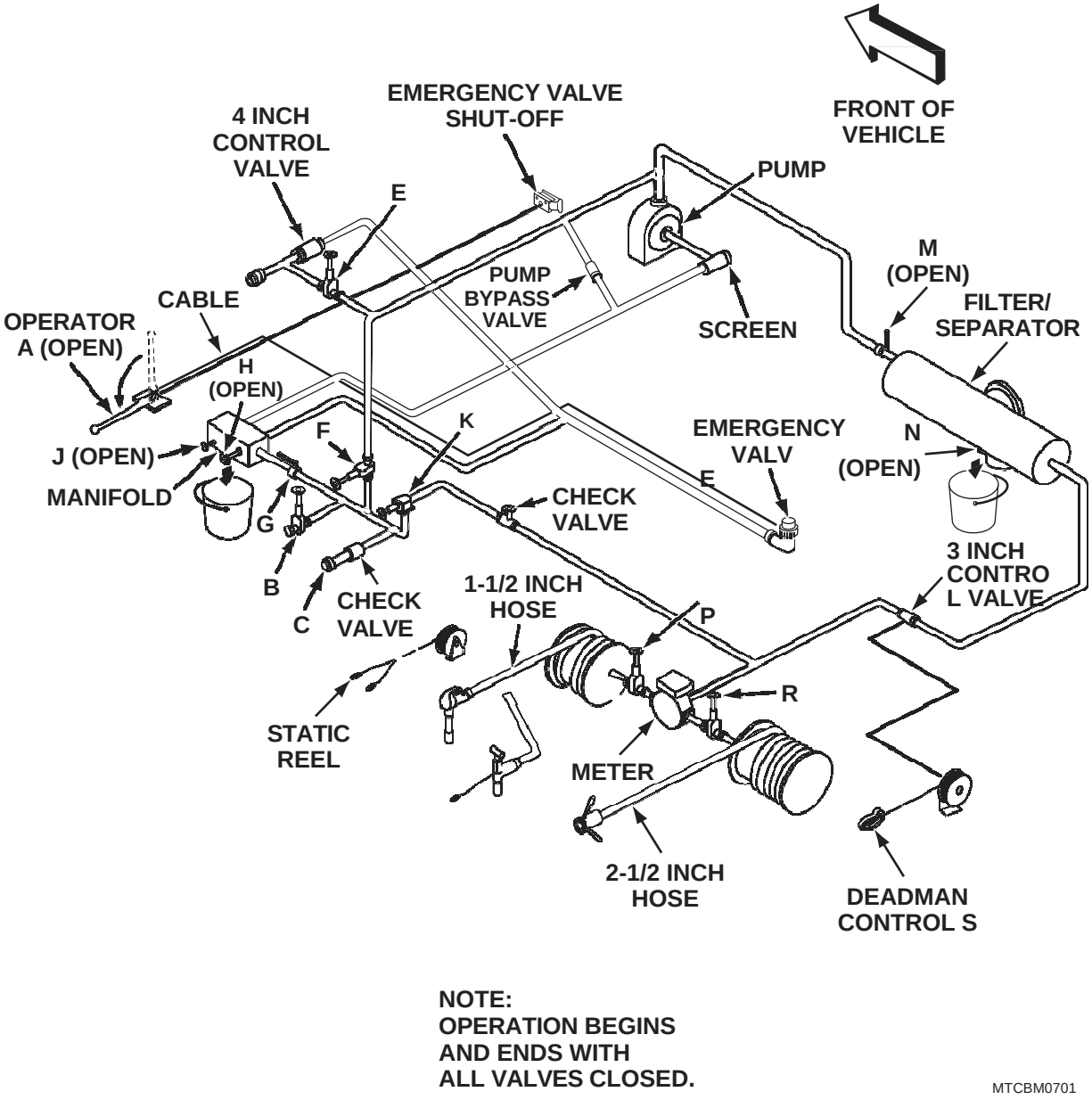


Figure 12. Typical Water Drain, All Models (M970A1 Shown).

FUEL FLOW SCHEMATICS - Continued

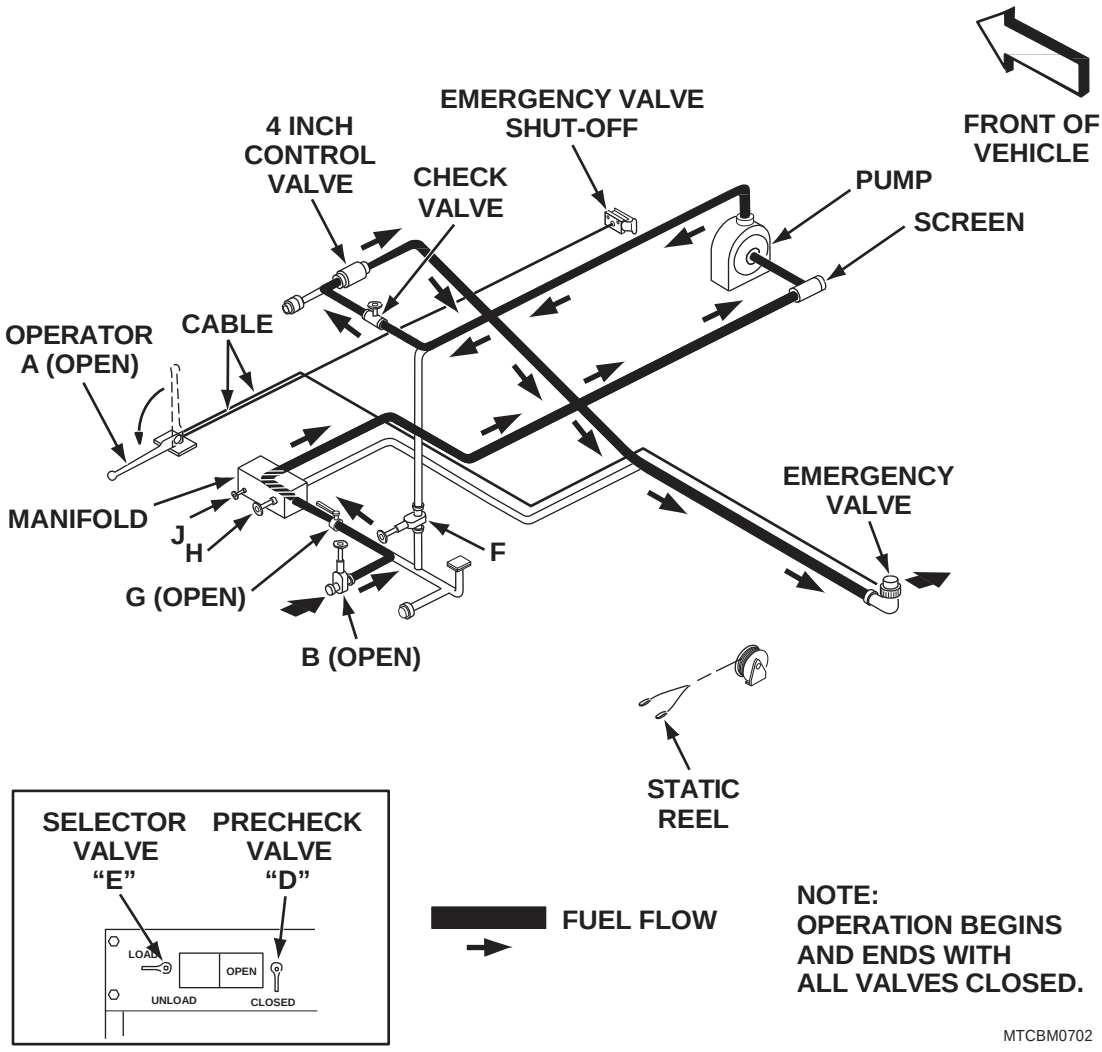


Figure 13. Self-Load Flow Diagram (M967A1 and M969A1).

FUEL FLOW SCHEMATICS - Continued

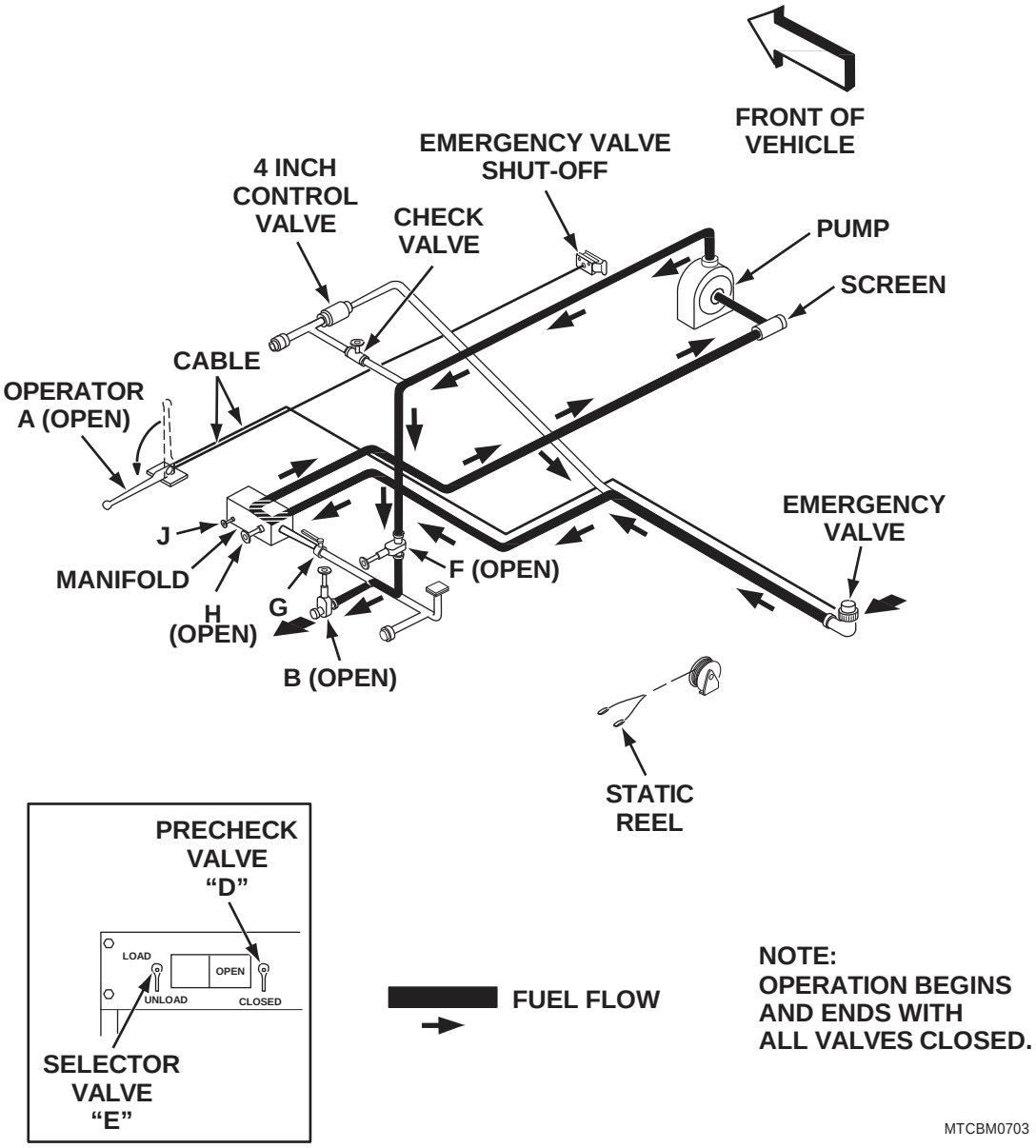


Figure 14. Typical Bulk Delivery Flow Diagram.

FUEL FLOW SCHEMATICS - Continued

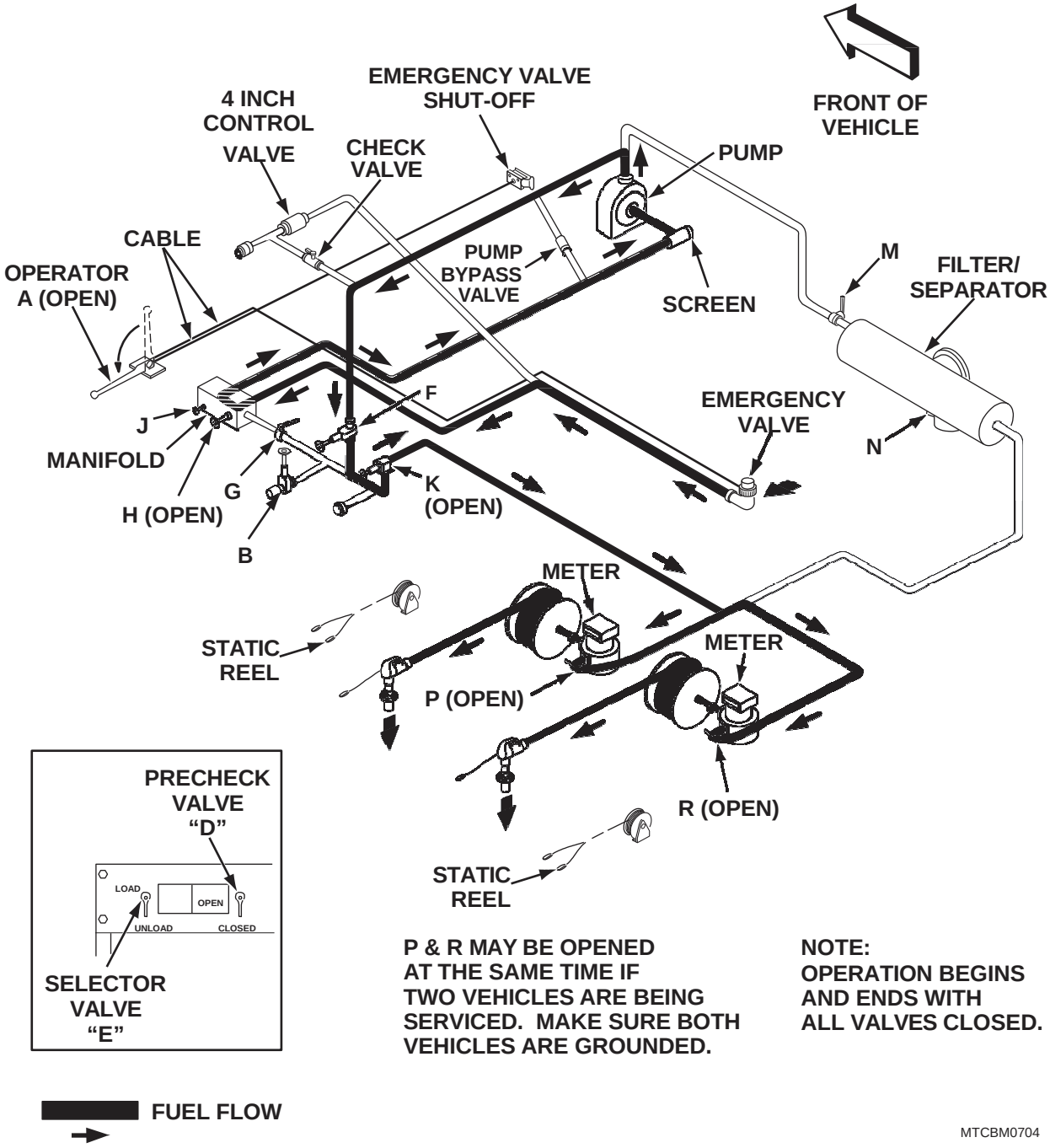


Figure 15. Nonfiltered Dispensing Flow Diagram (M969A1).

FUEL FLOW SCHEMATICS - Continued

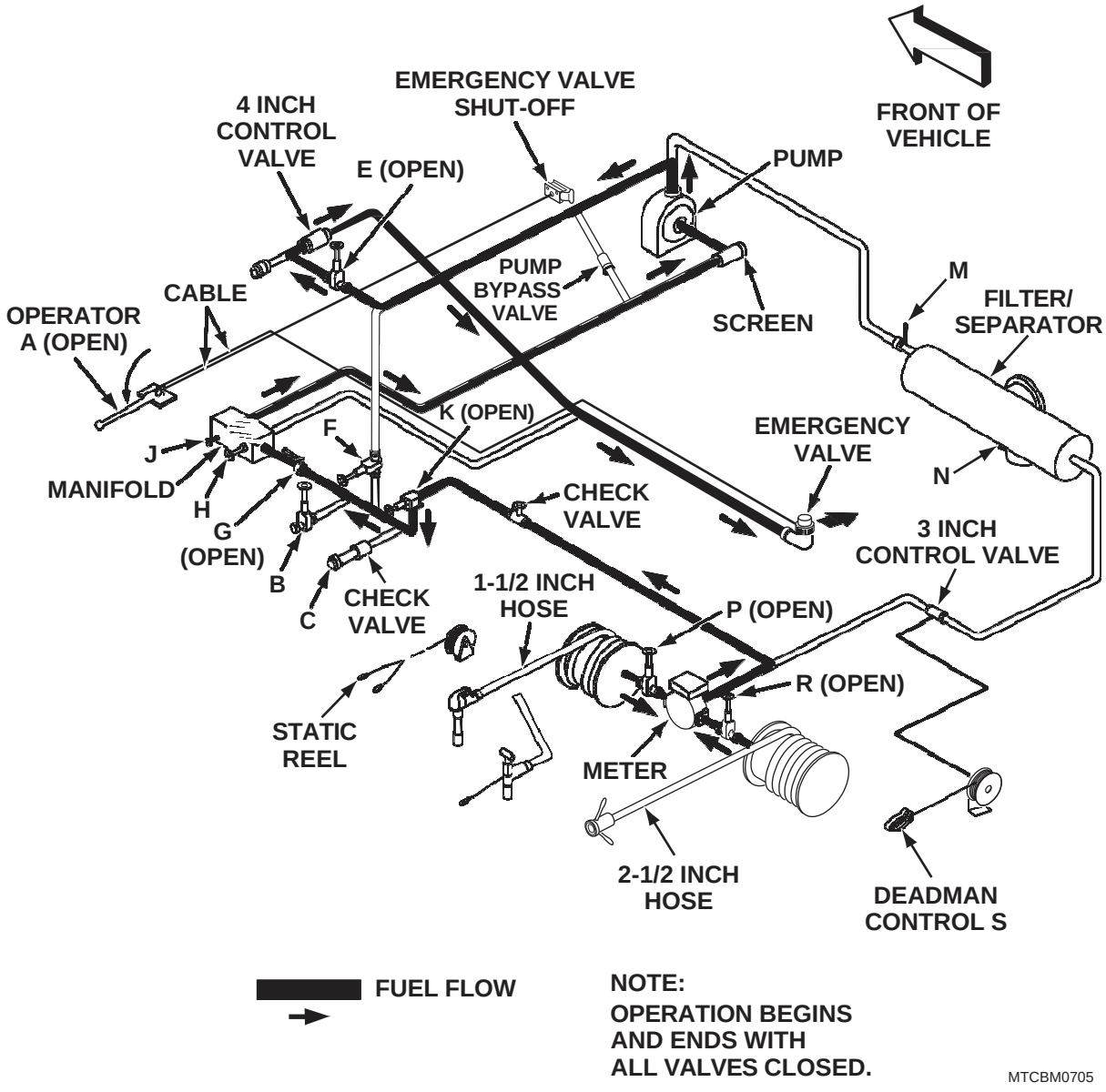


Figure 16. Hose Evacuation Flow Diagram (M970A1).

FUEL FLOW SCHEMATICS - Continued

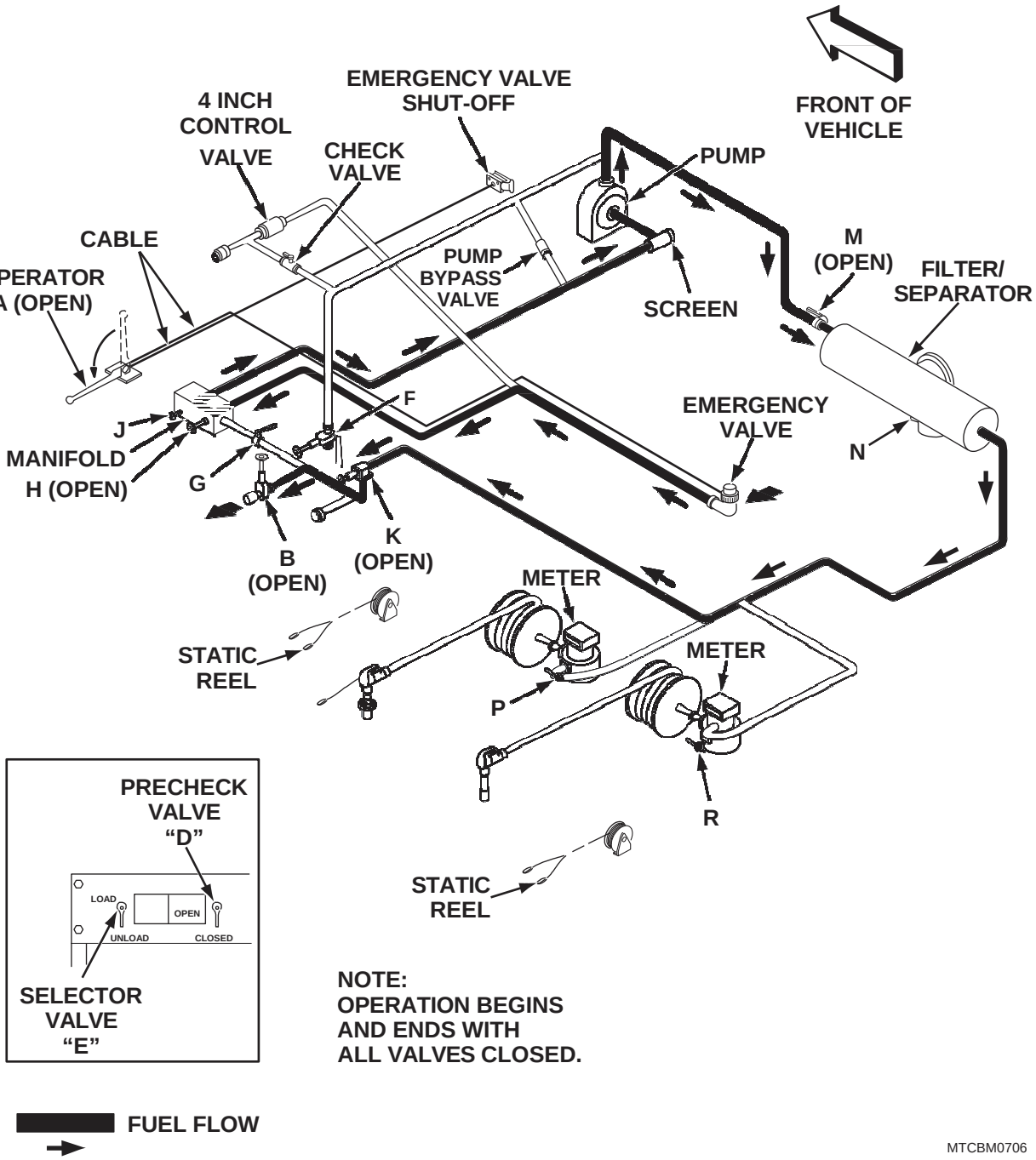


Figure 17. Filtered Bulk Delivery Flow Diagram (M969A1).

FUEL FLOW SCHEMATICS - Continued

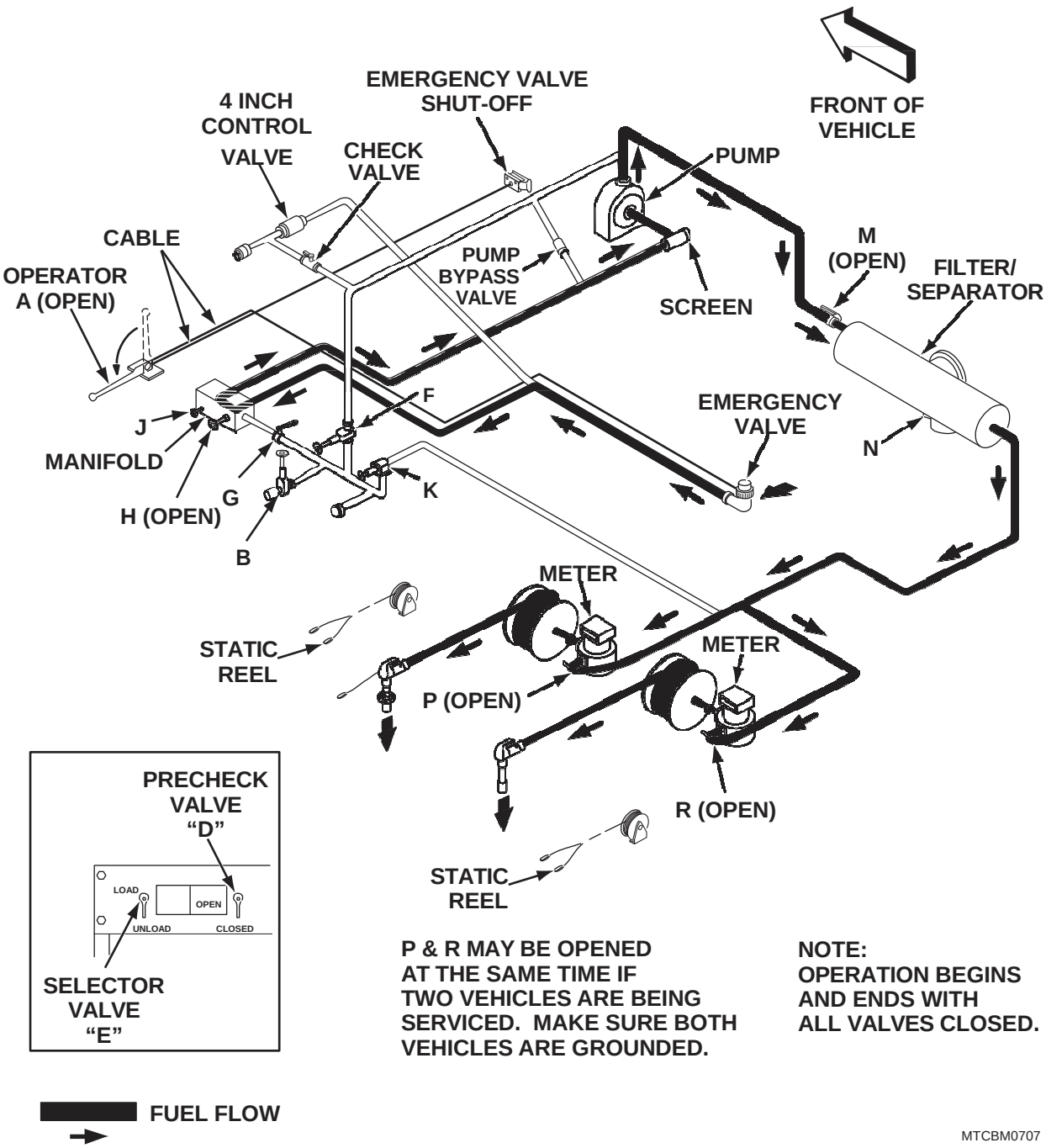


Figure 18. Filtered Fuel Dispensing Flow Diagram (M969A1).

FUEL FLOW SCHEMATICS - Continued

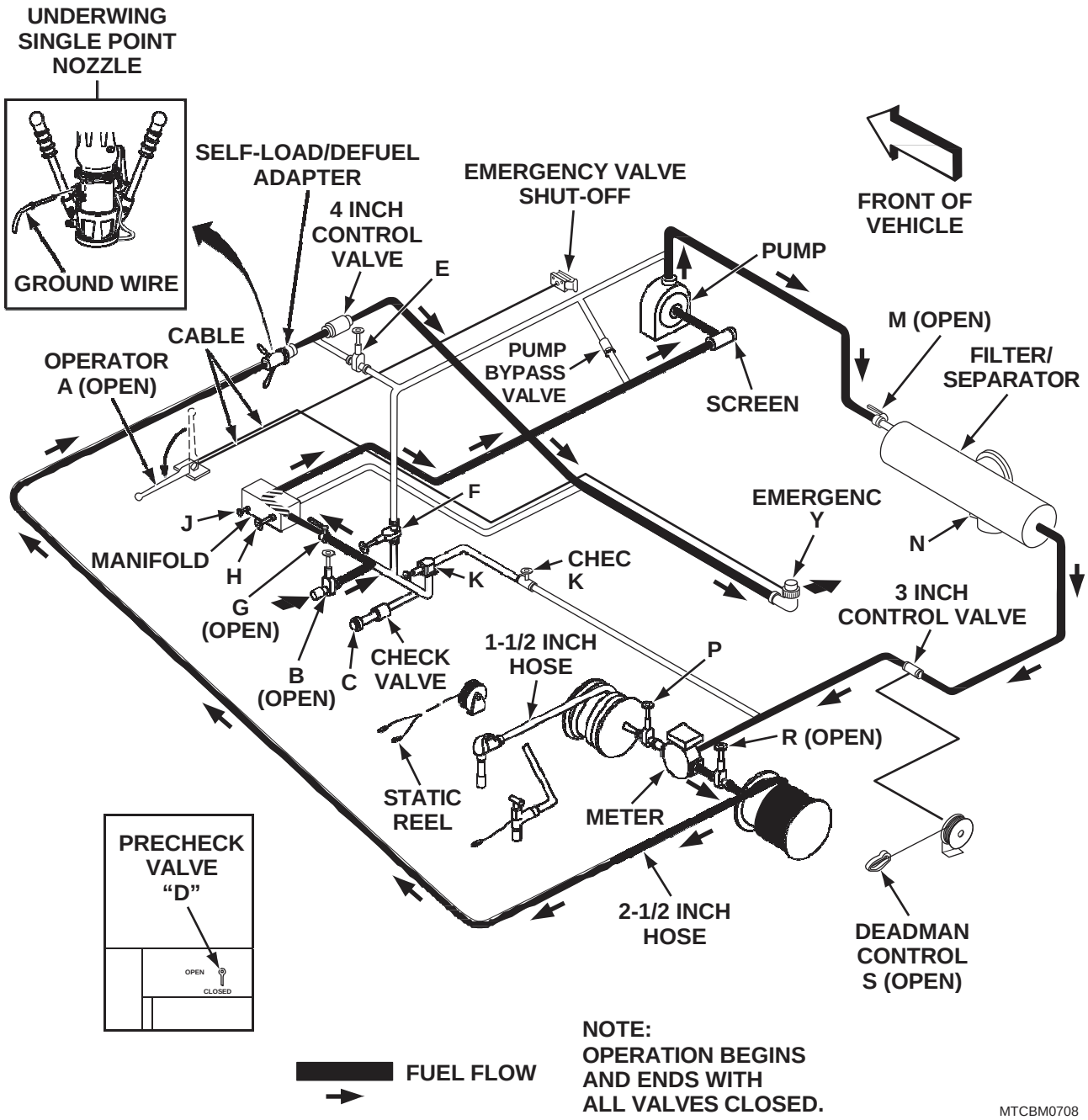


Figure 19. Filtered Self-Load Flow Diagram (M970A1).

FUEL FLOW SCHEMATICS - Continued

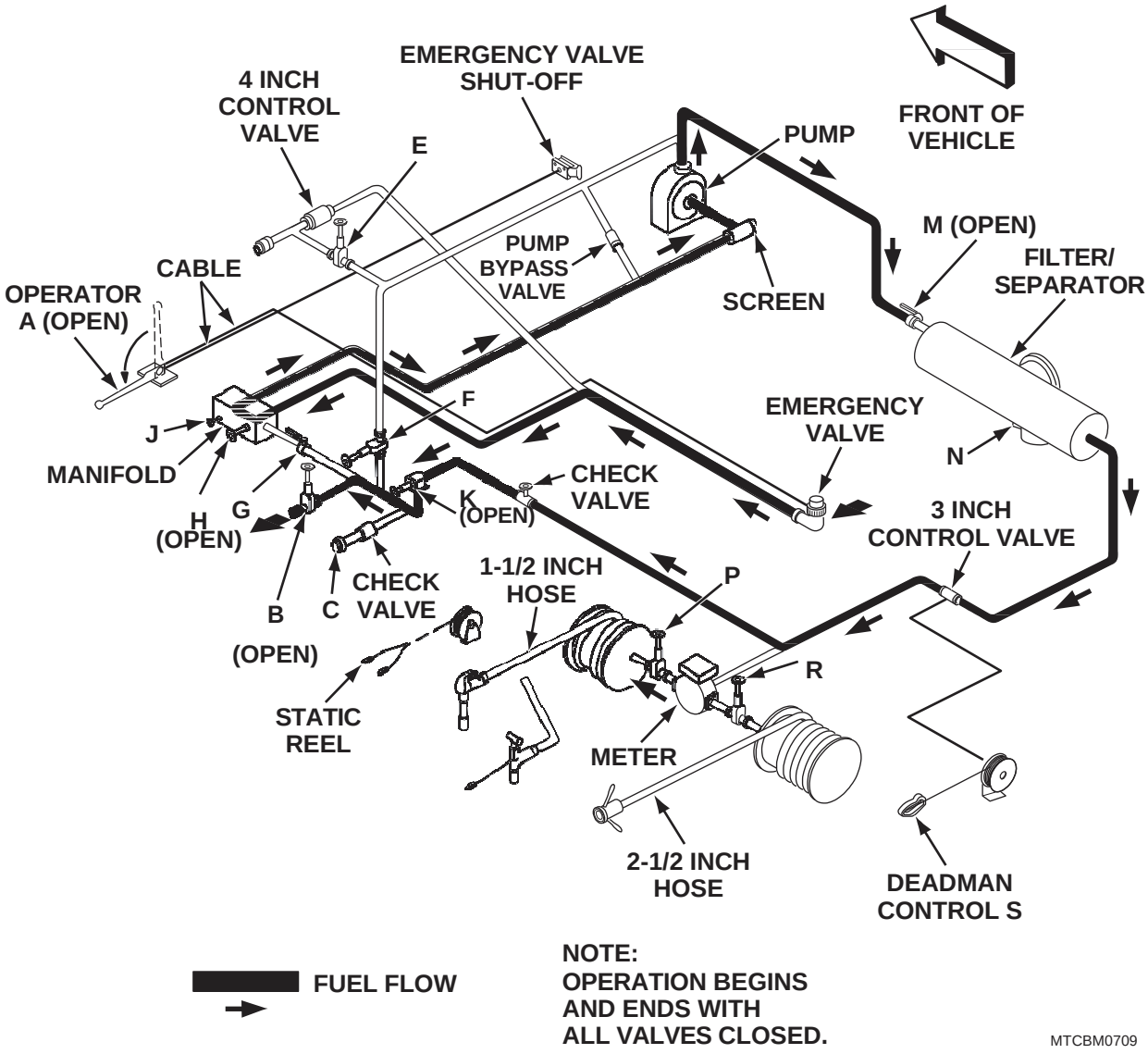


Figure 20. Filtered Bulk Delivery Flow Diagram (M970A1).

FUEL FLOW SCHEMATICS - Continued

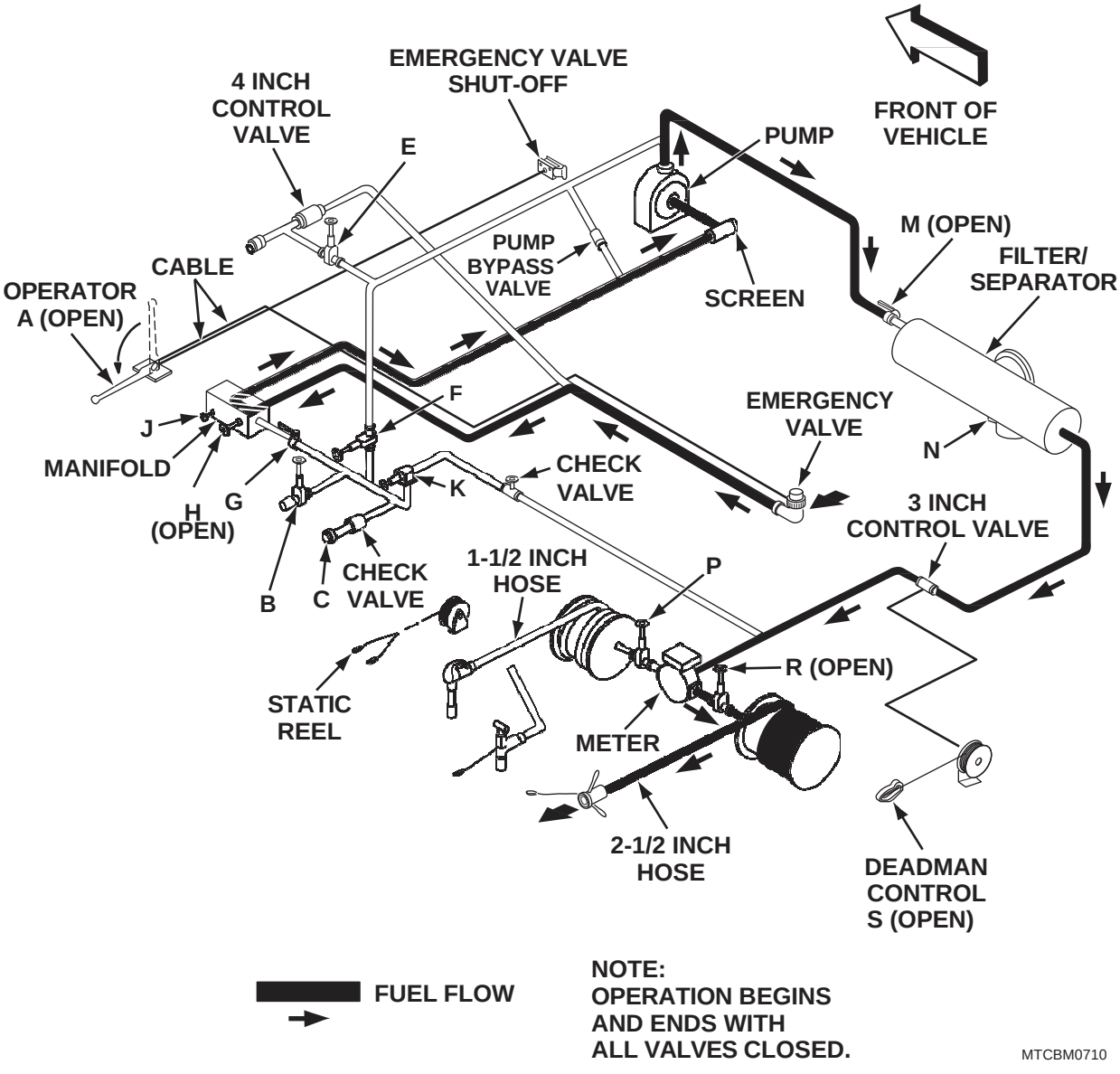


Figure 21. Single Point Underwing Fuel Dispensing Flow Diagram (M970A1).

FUEL FLOW SCHEMATICS - Continued

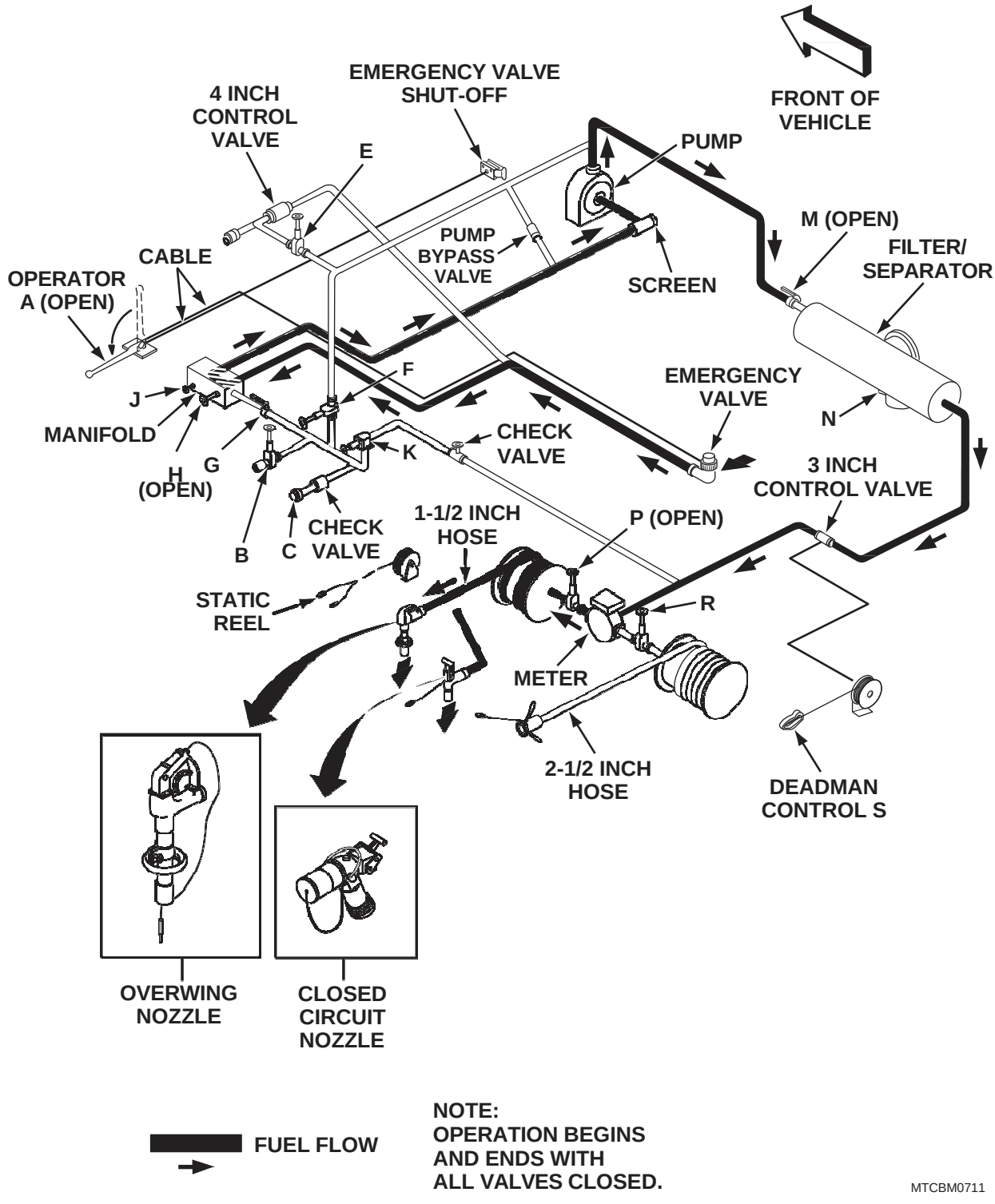


Figure 22. Aircraft Overwing/Closed Circuit Fuel Dispensing Flow Diagram.

FUEL FLOW SCHEMATICS - Continued

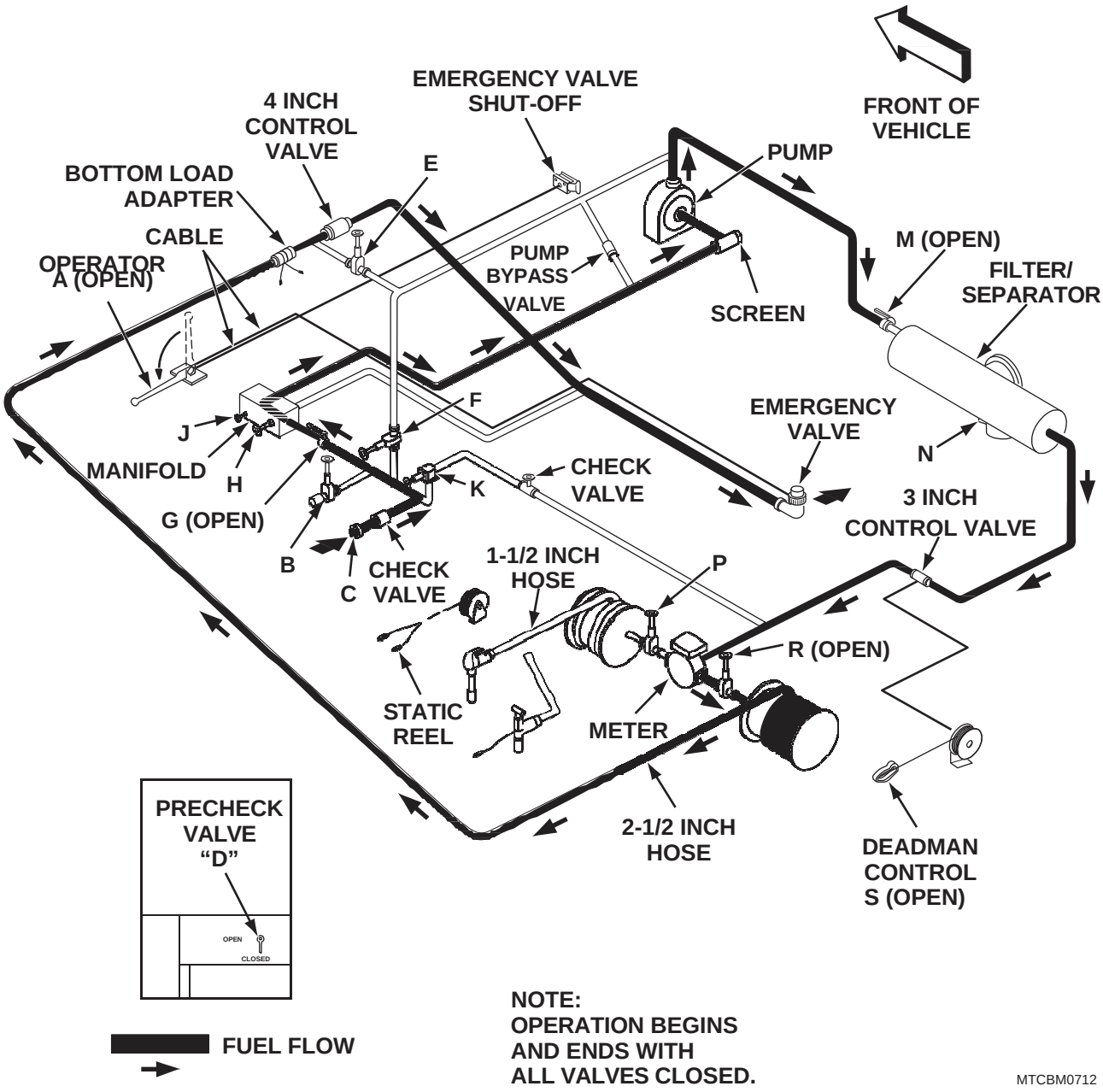


Figure 23. Diagram For Defueling Using 2-1/2 In. Hose (M970A1).

FUEL FLOW SCHEMATICS - Continued

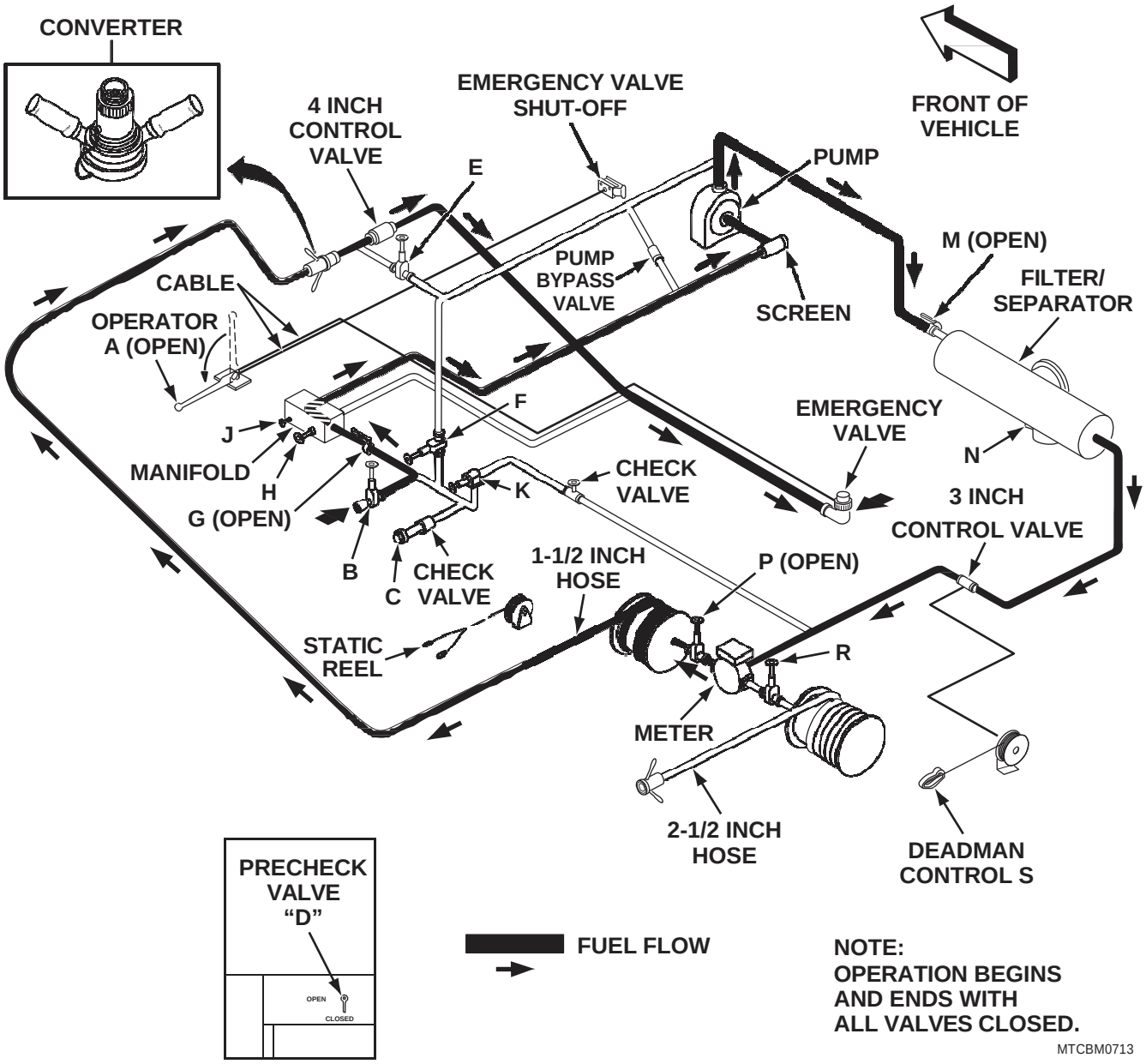


Figure 24. Diagram for Defueling Using 1-1/2 In. Hose (M970A1).

FUEL FLOW SCHEMATICS - Continued

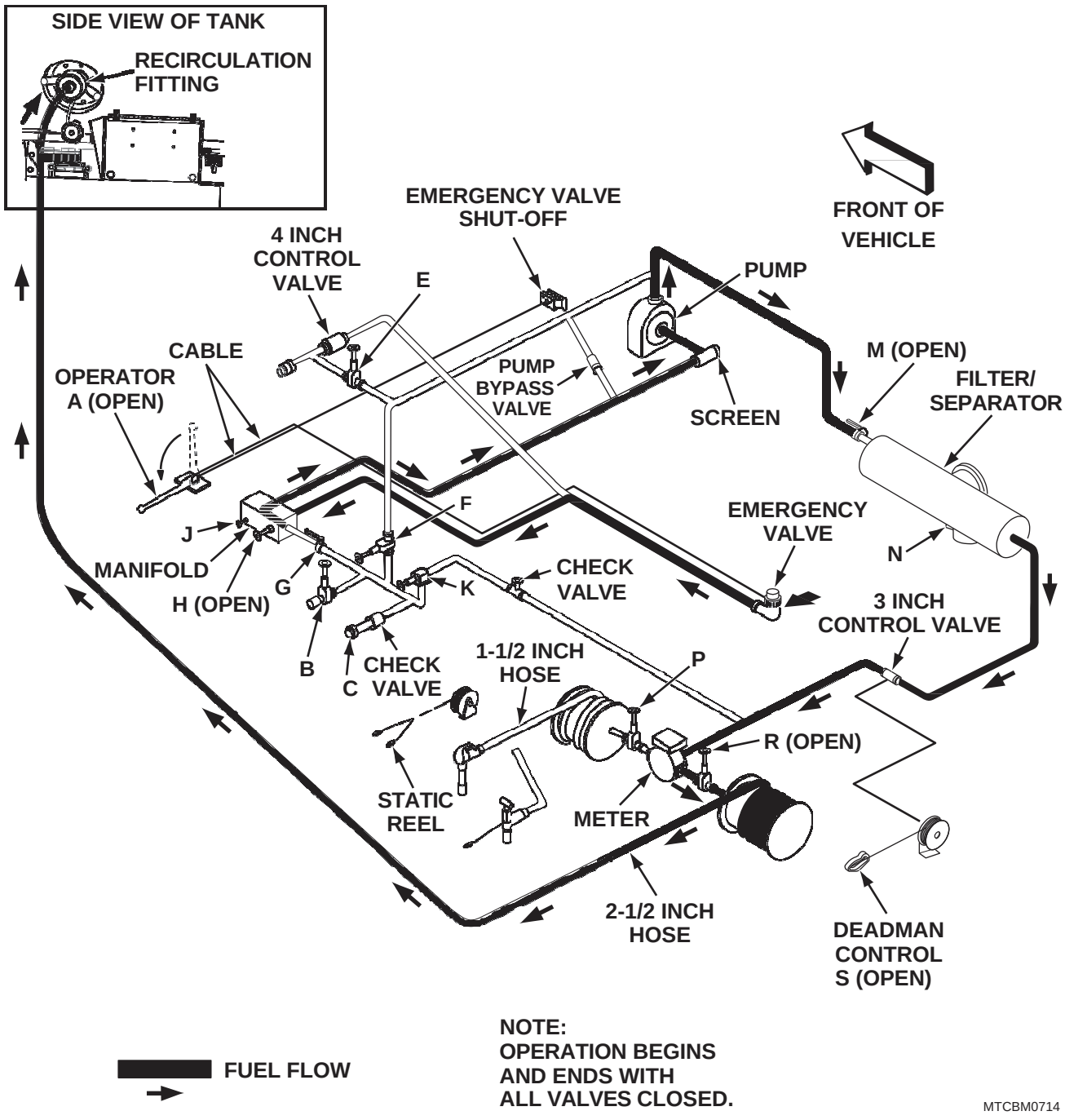


Figure 25. Diagram For Recirculating Using 2-1/2 In. Hose (M970A1).

FUEL FLOW SCHEMATICS - Continued

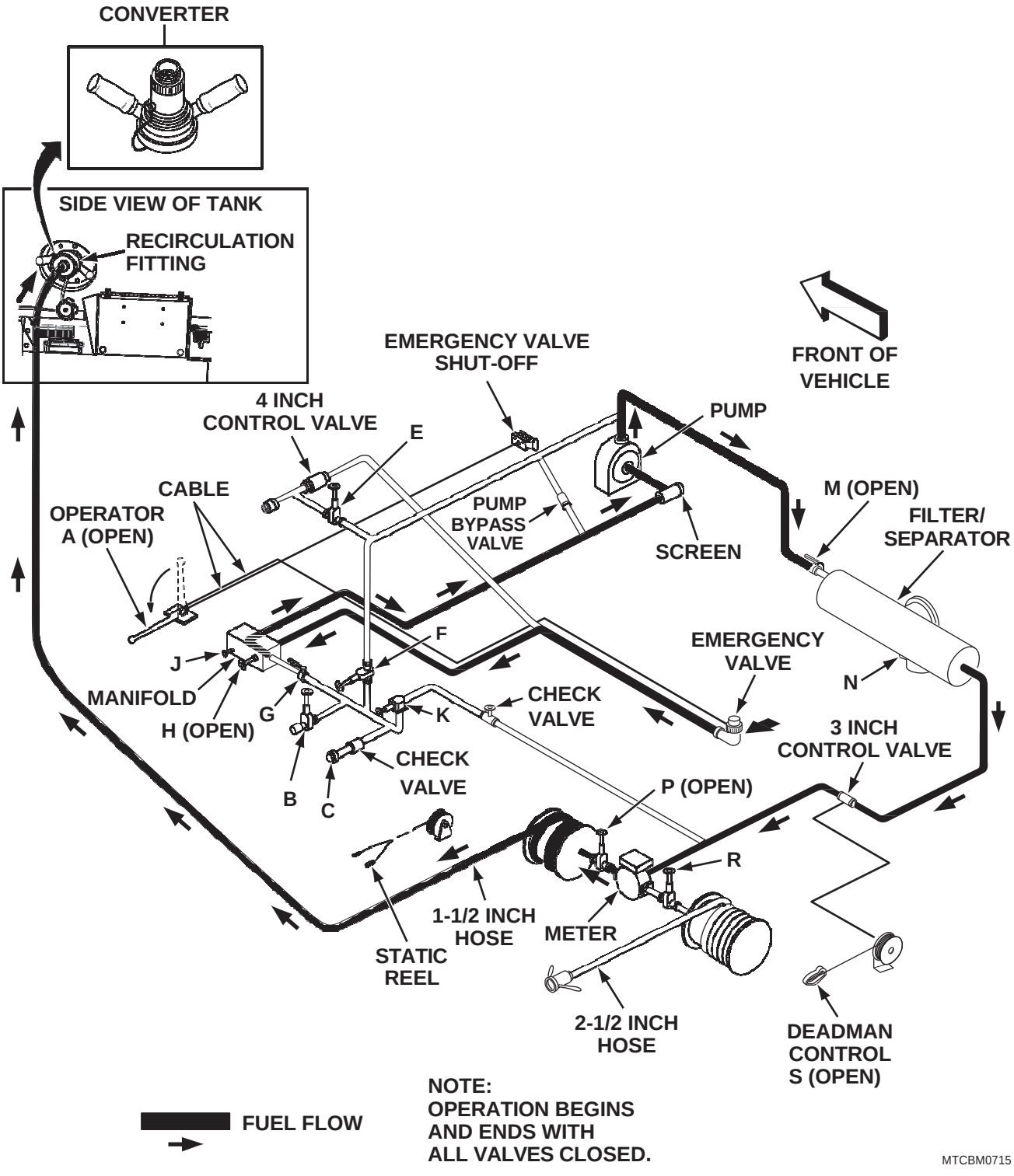


Figure 26. Flow Diagram For Recirculating Fuel Using 1-1/2 In. Hose (M970A1).

FUEL DISPENSING SCHEMATICS

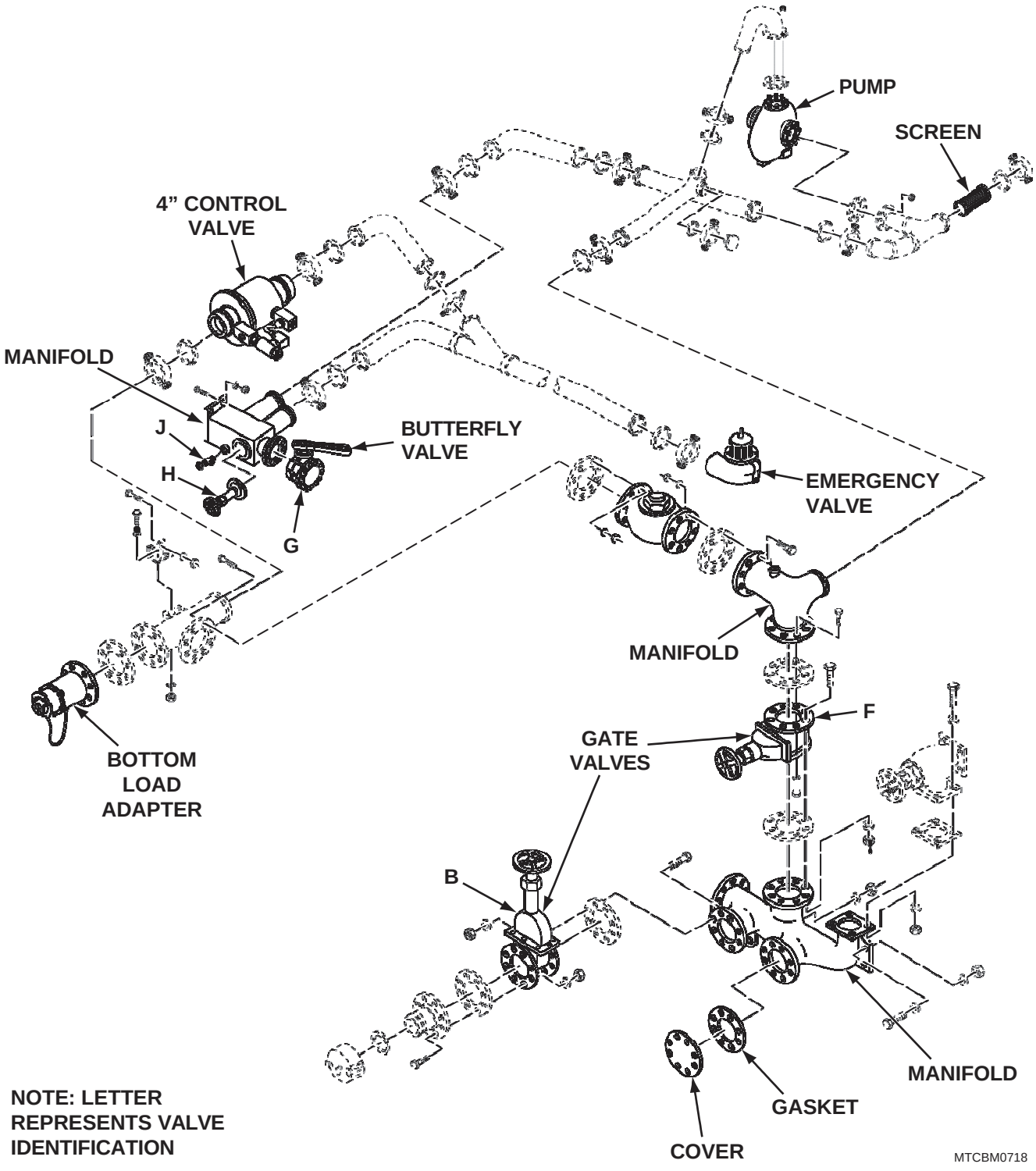


Figure 27. Dispensing System (M967A1).

FUEL DISPENSING SCHEMATICS - Continued

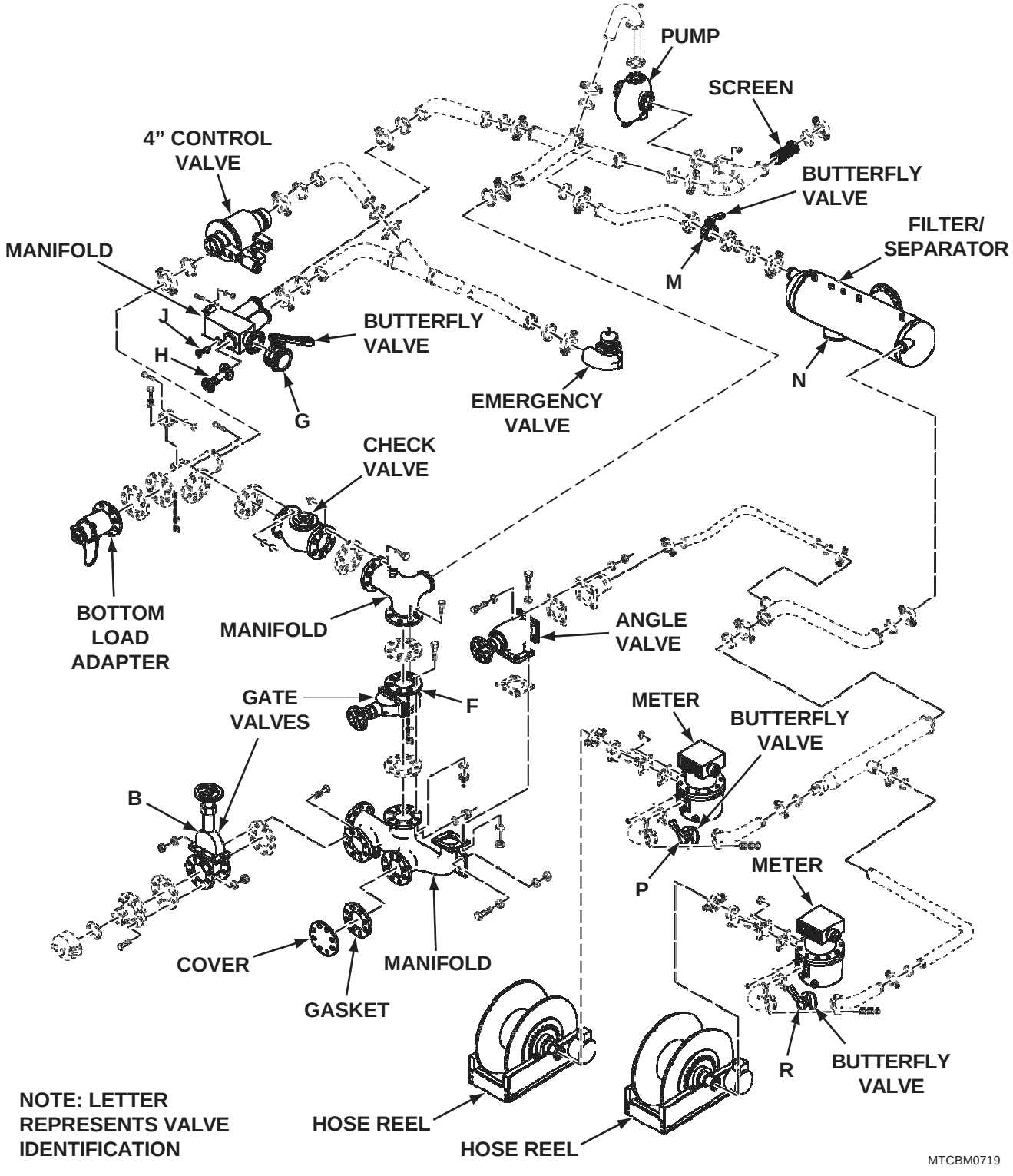


Figure 28. Dispensing System (M969A1).

FUEL DISPENSING SCHEMATICS - Continued

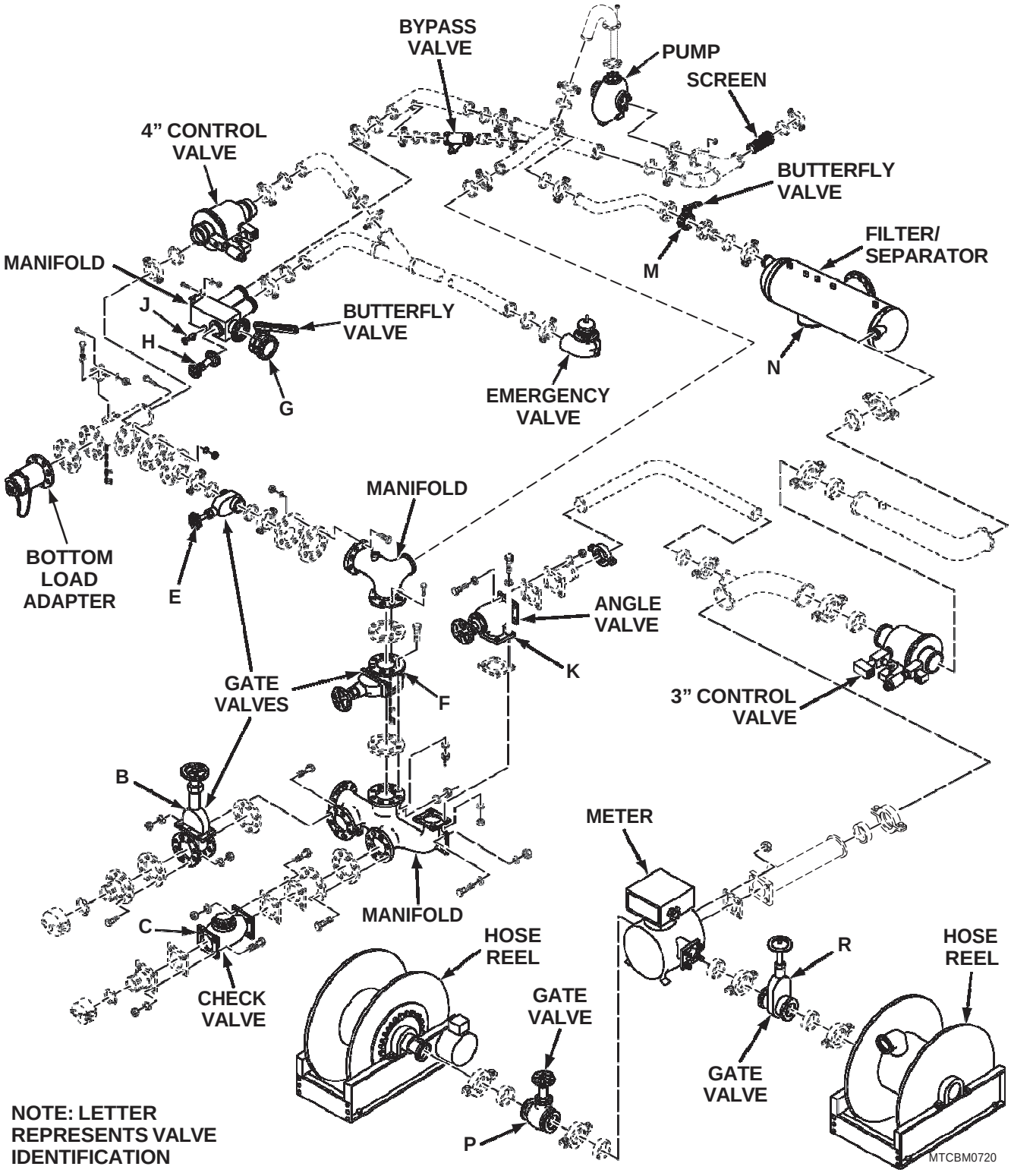


Figure 29. Dispensing System (M970A1).

END OF WORK PACKAGE

CHAPTER 7

SUPPORTING INFORMATION

FIELD MAINTENANCE
REFERENCES

GENERAL

This work package lists all forms, manuals, bulletins, and other publications that are referenced in this manual and/or are applicable to material covered in this manual. DA Pam 25-30, Consolidated Index of Army Publications and Blank Forms, should be consulted frequently for the latest changes or revisions to publications and for new publications relevant to material covered in the technical manual. Also consult DA Pam 350-9, Index and Description of Army Training Devices.

Forms

DA Pam 750-8	The Army Maintenance Management System (TAMMS) Users Manual.
DA Form 2028	Recommended Changes to Publications and Blank Forms
DA Form 2028-2	Recommended Changes to Equipment Technical Publications
DA Form 2404/5988-E	Equipment Inspection and Maintenance Worksheet
DA Form 2407/2407-E	Maintenance Request
DD Form 314	Preventative Maintenance Schedule and Record
DD Form 1397	Processing and Deprocessing Record for Shipment, Storage, and Issue of Vehicles and Spare Engines
SF Form 364	Report of Discrepancy (ROD)
SF Form 368	Product Quality Deficiency Report

Manuals

DOT 49CFR180.407	Vacuum Test Procedure
DOT 49CFR180.409	Vapor Integrity Test
DOT 49CFR180.415	Vapor Integrity Test
FM 3-6	Field Behavior of NBC Agents (Including Smoke and Incendiaries)
FM 3-11.3	Multiservice Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Contamination Avoidance
FM 3-11.4	Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical (NBC) Protection
FM 3-11.5	Multiservice Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Decontamination
FM 5-36	Route Reconnaissance and Classification

Manuals - Continued

FM 9-13	Ammunition Handbook
FM 9-207	Operation and Maintenance of Ordnance Materiel in Cold Weather (0 Degrees F to Minus 65 Degrees F)
FM 10-16	General Fabric Repair
FM 10-20	Organizational Maintenance of Military Petroleum Pipelines, Tanks, and Related Equipment
FM 10-67	Petroleum Supply in Theaters of Operations
FM 10-67-1	Concepts and Equipment of Petroleum Operations
FM 10-68	Aircraft Refueling
FM 10-69	Petroleum Supply Point Equipment and Operations
FM 10-71	Petroleum Tank Vehicle Operations
FM 10-71-1	Concepts and Equipment of Petroleum Operations
FM 20-3	Camouflage, Concealment, and Decoys
FM 20-22	Vehicle Recovery Operations
FM 21-11	First Aid for Soldiers
FM 21-305	Manual for Wheeled Vehicle Driver
FM 25-3	Training in Units
FM 25-101	Battle Focused Training
FM 31-70	Basic Cold Weather Manual
FM 31-71	Northern Operations
FM 55-30	Army Motor Transport Units and Operations
FM 90-3	Desert Operations (How to Fight)
FM 90-6	Mountain Operations
FM 101-5-1	Operational Terms and Symbols
Method 27	Vapor Tightness of Gasoline Tank-Pressure Vacuum
TB 43-0213	Corrosion Prevention and Control (CPAC) for Army Wheeled Vehicles
TB ORD 1031	Purging, Cleaning, Inspecting, and Coating Interior Of Steel TA Equipment on Tactical and Commercial Type Fuel Tank Trucks
TM 9-214	Inspection, Care and Maintenance Of Antifriction Bearings
TM 9-238	Deepwater Fording of Ordnance Material
TM 9-247	Materials Used For Cleaning, Preserving, Abrading, and Cementing Ordnance Material; and Related Materials Including Chemicals
TM 9-2320-270-34P	Field Maintenance Repair Parts and Special Tools List for Truck, Tractor, Commercial Heavy Equipment Transporter

Manuals - Continued

	(C-HET); 85,000 GVWR, 8x6, Army Model M911 (NSN 2320-01-025-3733)
TM 9-2330-339-23P	Field And Sustainment Repair Parts And Special Tools List For Semitrailer, Tank, 5000 Gallon: M967A1, M969A1, M969A2, M970A1
TM 9-2610-200-14	Operator's Field Maintenance Manual for Care, Maintenance, Repair, and Inspection of Pneumatic Tires and Inner Tubes
TM 9-2610-200-20	Organizational Care, Maintenance and Repair of Pneumatic Tires, Inner Tube
TM 9-6140-200-14	Lead-Acid Storage Batteries
TM 43-0139	Painting Instructions for Army Material
TM 55-2200-001-12	Transportability Guidance for Application of Blocking, Bracing and Tiedown Materials for Rail Transport
TM 743-200-1	Storage and Materials Handling
TM 750-244-6	Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use

Pamphlets, Bulletins, and Handbooks

DA Pam 25-30	Consolidated Index of Army Publications and Blank Forms
DA Pam 750-8	The Army Maintenance Management System (TAMMS) Users Manual
DA FORM 2404	Equipment Inspection and Maintenance Worksheet
DA FORM 5988-E	Equipment Inspection Maintenance Worksheet
MTMCTEA Ref. No. 92-55-20	Tiedown Handbook for Truck Movements
TB ORD 1031	Purging, Cleaning, Inspecting, and Coating Interior of Steel Tanks and Equipment on Tactical and Commercial Type Fuel Tank Trucks and Trailers
TB 43-0209	Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment, and Materials Handling Equipment
TB 43-0213	Corrosion Prevention and Control (CPC) for Tactical Vehicles
TC 9-237	Operator's Circular Welding Theory and Application

Regulations

AR 190-13	The Army Physical Security Program
AR 190-51	Security of Unclassified Army Property (Sensitive and Nonsensitive)

Regulations - Continued

AR 200-1	Environmental Protection and Enhancement
AR 220-1	Army Unit Status Reporting and Force Registration Consolidated Policie
AR 700-138	Army Logistics Readiness and Sustainability
AR 702-7	Product Quality Deficiency Report Program
AR 750-1	Army Materiel Maintenance Policy
CTA 8-100	Army Medical Department Expendable/Durable Items
CTA 50-970	Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items)
MIL-STD-12	Abbreviations for Use on Drawings, Specifications, Standards, and in Technical Documents

Miscellaneous

SOUM 13-0008	Safety of Use Messages
TC 21-305-20	Manual for Wheeled Vehicle Driver

END OF WORK PACKAGE

FIELD MAINTENANCE
MAINTENANCE ALLOCATION CHART (MAC) INTRODUCTION

INTRODUCTION

The Army Maintenance System MAC

This introduction provides a general explanation of the maintenance and repair functions.

The MAC (immediately following this introduction) designates overall authority and responsibility for the performance of maintenance tasks on the identified end item or component. The application of the maintenance tasks to the end item or component shall be consistent with the capacities and capabilities of the designated maintenance levels/classes, which are shown in the MAC in column (4). Column (4) is divided into two secondary columns. These columns indicate the maintenance levels/classes of ‘Field’ and ‘Sustainment’. Each maintenance level column is further divided into two sub-columns. These sub-columns identify the maintenance classes and are as follows:

1. Field level maintenance classes:

    a. **Crew (operator) maintenance.** This is the responsibility of a using organization to perform maintenance on its assigned equipment. It normally consists of inspecting, servicing, lubricating, adjusting, and replacing parts, minor assemblies, and subassemblies. Items with a “C” (“O” for joint service reporting) in the third position of the Source, Maintenance, and Recoverability (SMR) code may be replaced at the crew (operator) class. A code of “C” (“O” for joint service) in the fourth position of the SMR code indicates complete repair is authorized at the crew (operator) class.

    b. **Maintainer maintenance.** This is maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion by field level units. This maintenance is performed either on the system or after it is removed. An “F” in the third position of the SMR code indicates replacement of assemblies, subassemblies, or other components is authorized at this level. An “F” in the fourth position of the SMR code indicates complete repair of the identified item is allowed at the Maintainer class. Items repaired at this level are normally returned to the user after maintenance is performed.

2. Sustainment level maintenance classes:

    a. **Below depot sustainment.** This is maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion either on the system or after it is removed. The item subject to maintenance has normally been forwarded to a maintenance facility away from the field level supporting units. An “H” in the third position of the SMR code indicates replacement of assemblies, subassemblies, or other components is authorized at this class. An "H" appearing in the fourth position of the SMR code indicates complete repair is possible at this class. Items are normally returned to the supply system after maintenance is performed at this class.

    b. **Depot.** This is maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion either on the system or after it is removed. Assets to be repaired at this class are normally returned to an Army Depot or authorized contractor facility. The replace function for this class of maintenance is indicated by the letter "D" or "K" appearing in the third position of the SMR code. A "D" or "K" appearing in the fourth position of the SMR code indicates complete repair is possible at the depot sustainment maintenance level. Items are returned to the supply system after maintenance is performed at this class.

The Tools and Test Equipment Requirements Table (immediately following the MAC) lists the tools and test equipment (both special tools and common tool sets) required for each maintenance task as referenced from the MAC.

INTRODUCTION - Continued

The Remarks Table (immediately following the tools and test equipment requirements) contains supplemental instructions and explanatory notes for a particular maintenance task.

Maintenance Tasks

Maintenance tasks are limited to and defined as follows:

1. **Inspect.** A function to determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).
2. **Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards, e.g., load testing of lift devices or hydrostatic testing of pressure hoses.
3. **Service.** Operations required periodically to keep an item in proper operating condition such as replenishing fuel, lubricants, chemical fluids, or gases.
4. **Adjust.** To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.
5. **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.
6. **Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments of test, measuring, and diagnostic equipment used in precision measurement. It consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.
7. **Remove.** The act of taking a sub-component off an asset to allow repair or replacement of that sub-component, or to facilitate other maintenance.
8. **Install.** The act of placing, positioning, or otherwise locating a component or sub-component to make it part of a higher level end item. Install can be to install a new asset for the first time or reinstall an asset previously removed. The maintenance level/class allowed to perform an installation is determined by the third position in the SMR code.
9. **Replace.** To install a serviceable component in place of one that is unserviceable or a required time change asset. “Replace” is authorized by the MAC and the assigned maintenance class is shown as the third position code of the SMR code.
10. **Repair.** The application of maintenance actions, including fault location/troubleshooting, removal, installation, disassembly, assembly, or other maintenance actions to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in the item.
11. **Paint.** This is a function to prepare and apply coats of paint. When used with munitions, the paint is applied so the ammunition can be identified and protected.

NOTE

The following definitions are applicable to the “repair” maintenance task:

Fault location/troubleshooting. The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).

Actions. Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

12. **Overhaul.** This is the maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in the appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to a like new condition.

INTRODUCTION - Continued

13. **Rebuild.** This consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.
14. **Lubricate.** The act of applying a material (e.g., oil or grease) to reduce friction and allow a component to operate in a more efficient manner.
15. **Mark.** The process of restoring obliterated identification on an asset.
16. **Pack.** To place an item into a container for either storage or shipment after service and other maintenance operations have been completed.
17. **Unpack.** The act or removing an asset from a storage or shipping container in preparation to perform further maintenance (e.g., repair or install).
18. **Preserve.** The action required to treat systems and equipment whether installed or stored, to ensure a serviceable condition.
19. **Prepare for use.** Those steps required to make an asset ready for other maintenance (e.g., remove preservatives, lubricate, etc.).
20. **Assemble.** The step-by-step instructions to join the component pieces of an asset together to make a complete serviceable asset.
21. **Disassemble.** The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).
22. **Clean.** Step-by-step instructions on how to remove dirt, corrosion or other contaminants from equipment.
23. **Non destructive inspection.** Step-by-step instructions on preparation and accomplishment inspections which do not destroy or damage the equipment.
24. **Place in service.** Step-by-step instructions required to place an item into service that are not covered in the service upon receipt work package.
25. **Towing.** The step-by-step instructions to connect one vehicle to another for the purpose of having one vehicle moved through the motive power of the other vehicle.
26. **Jacking.** The step-by-step instructions to mechanically raise or lift a vehicle to facilitate maintenance on the vehicle.
27. **Parking.** Step-by-step instructions to safely place a vehicle in a lot, ramp area or other designated location.
28. **Mooring.** Step-by-step instructions to secure a vehicle by chains, ropes or other means to protect the vehicle from environmental conditions or secure for transportation.
29. **Covering.** Step-by-step instructions to place a protective wrapping over a vehicle to protect it from environmental conditions or to hide (e.g., camouflage) it.
30. **Hoisting.** Step-by-step instructions to allow a vehicle to be raised by cables or ropes through attaching points.
31. **Sling loading.** Step-by-step instructions to place a sling around a vehicle to allow it to be raised.
32. **External power.** Step-by-step instructions on how to apply electrical power from any authorized power source (e.g., external generator or facility power).
33. **Preparation for storage or shipment.** Step-by-step instructions for preparing the equipment for placement into administrative storage or for special transportation requirements.
34. **Arm.** Detailed instructions on activating munitions prior to use.
35. **Load.** This may be one of two tasks:

INTRODUCTION - Continued

a. For transportation, the act of placing assets onto a transportation medium (e.g., pallet, truck, container).

b. For weapons/weapons systems, the act of placing munitions into the weapon/weapons system.

36. **Unload.** This may be one of two tasks:

a. For transportation, the act of removing assets from a transportation medium (e.g., pallet, truck, container).

b. For weapons/weapons systems, the act of removing munitions from the weapon/weapons system.

37. **Software maintenance.** Step-by-step instructions for software maintenance (e.g., installing, un-installing, etc.).

EXPLANATION OF COLUMNS IN THE MAC

Column (1) Group Number. Column (1) lists Functional Group Code (FGC) numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

Column (2) Component/Assembly. Column (2) contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

Column (3) Maintenance Task. Column (3) lists the functions to be performed on the item listed in column (2). (For a detailed explanation of these functions, refer to “Maintenance Tasks” outlined previously).

Column (4) Maintenance Level. Column (4) specifies each level/class of maintenance authorized to perform each function listed in column (3), by indicating work time required in the appropriate sub-column. This work time figure represents the active time required to perform that maintenance task at the indicated level/class of maintenance. If the number or complexity of the tasks within the listed maintenance task varies at different maintenance classes, appropriate work time figures are to be shown for each class.
The work time figure represents the average time required to perform the prescribed task (assembly, subassembly, component, module, end item, or system) on the item under typical operating conditions for that maintenance level/class. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance tasks authorized in the MAC. The symbol designations for the various maintenance levels/classes and classes are as follows:

Field:

C Crew maintenance

F Maintainer maintenance

Sustainment:

L Specialized Repair Activity (SRA)

H Below depot maintenance

D Depot maintenance

INTRODUCTION - Continued

NOTE

The “L” maintenance class is not included in column (4) of the MAC. Functions to this class of maintenance are identified by work time figure in the “H” column of column (4), and an associated reference code is used in the REMARKS column (6). This code is keyed to the remarks and the SRA complete repair application is explained there.

Column (5) Tools and Equipment Reference Code. Column (5) specifies, by a number code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

Column (6) Remarks Code. When applicable, this Column (6) contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

EXPLANATION OF COLUMNS IN THE TOOLS AND TEST EQUIPMENT REQUIREMENTS

Column (1) Tool or Test Equipment Reference Code. The tool or test equipment reference code correlates with a code used in column (5) of the MAC.

Column (2) Maintenance Level. The lowest class of maintenance authorized to use the tool or test equipment.

Column (3) Nomenclature. Name or identification of the tool or test equipment.

Column (4) National Stock Number (NSN). The NSN of the tool or test equipment.

Column (5) Tool Number. The manufacturer's part number.

EXPLANATION OF COLUMNS IN THE REMARKS

Column (1) Remarks Code. The code recorded in column (6) of the MAC.

Column (2) Remarks. This column lists information pertinent to the maintenance task being performed as indicated in the MAC.

END OF WORK PACKAGE

FIELD MAINTENANCE
MAINTENANCE ALLOCATION CHART (MAC)

Table 1. Maintenance Allocation Chart (MAC).

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
00	M969A3 TRAILER							
0000-01	PMCS (BEFORE)	Inspect	0.4					
		Service	0.1					
0000-02	PMCS (DURING)	Inspect	0.1					
0000-03	PMCS (AFTER)	Inspect	0.1					
0000-04	PMCS (ANNUAL/ SEMI-ANNUAL)	Inspect		0.4				
		Service		0.2				
0000-01	PMCS (BEFORE)	Inspect	0.4					
		Service	0.1					
0000-02	PMCS (DURING)	Inspect	0.1					
0000-03	PMCS (AFTER)	Inspect	0.1					
0000-04	PMCS (ANNUAL/ SEMI-ANNUAL)	Inspect		0.4				
		Service		0.2				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
06	ELECTRICAL SYSTEM							
0609	MARKER LIGHT LAMP/ L.E.D. AND LENS	Replace		.27				
		Repair		.25			1	
	MARKER LIGHT	Replace		.35			1	
		Repair		.52			1	
	COMPOSITE STOP, TAIL, AND BLACKOUT LIGHT	Replace		.43			1	
		Repair		1.20			1	
	CONTROL PANEL LIGHT ASSEMBLY	Test		0.6			1	
		Replace		1.0			1	
		Repair		1.0			1	
0612	BATTERIES, TERMINALS, AND CABLES	Test		0.5				
		Replace		1.0				
		Repair		1.0				
	BATTERY STORAGE	Replace		0.33			1	
	BATTERY, CABLE	Replace		0.30				
0613	FRONT BLACKOUT MARKER LIGHTS WIRING HARNESS	Replace		5.18			1	

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	MAIN TRAILER WIRING HARNESS	Replace		4.52			1	
	ENGINE ELECTRICAL CONDUIT	Replace		2.85			1	
	ENGINE ELECTRICAL CONDUIT	Replace		0.23			1	
	ELECTRICAL WIRING	Repair		1.00				
	ROADSIDE MARKER LIGHT LEAD ASSEMBLY	Replace		1.60			1	
		Repair		1.83			1	
	ROADSIDE FRONT MARKER LIGHT LEAD ASSEMBLY	Replace		1.85			1	
		Repair		3.33			1	
	ROADSIDE REAR COMPOSITE LIGHT LEAD ASSEMBLY	Replace		1.52			1	
		Repair		3.33			1	
	CONNECTOR LEAD ASSEMBLY	Replace		1.85			1	
		Repair		2.0			1	
	TRIPLE MARKER LIGHT LEAD ASSEMBLY	Replace		1.85			1	
		Repair		2.0			1	

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	CURBSIDE MARKER LIGHT LEAD ASSEMBLY	Replace		1.85			1	
		Repair		2.0			1	
	CURBSIDE REAR COMPOSITE LIGHT LEAD ASSEMBLY	Replace		1.85			1	
		Repair		2.0			1	
	INTERVEHICULAR RECEPTICLE ASSEMBLY	Replace		1.85			1	
		Repair		2.0			1	
	REAR BLACKOUT MARKER LIGHT LEAD ASSEMBLY (M969A2)	Replace		0.95			1	
		Repair		1.95			1	
	ELECTRICAL LEAD ASSEMBLY 12267081	Replace		0.95			1	
		Repair		1.95			1	
	WIRING HARNESS AND LEAD ASSEMBLY	Replace		1.85			1	
		Repair		2.0			1	
	WIRING HARNESS COMPON-ENTS	Replace		3.52			1	
		Repair		5.25			1	

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
11	REAR AXLE							
1100	AXLE	Replace		3.00				
		Repair		2.50				
	AXLE 'P' AND 'Q' TYPE BRAKES	Replace		3.00				
		Repair		3.00				
	BOGIE ASSEMBLY	Replace		3.00				
12	BRAKE SYSTEM							
1202	BRAKE ACTUATION CAMSHAFT 'P' TYPE	Replace		1.00				
	BRAKE ACTUATION CAMSHAFT 'Q' TYPE	Replace		1.00				
	BRAKE SHOE 'P' TYPE	Adjust		1.33			1	
		Replace		6.42				
		Repair		5.27				
	BRAKE SHOE 'Q' TYPE	Adjust		1.33			1	
		Replace		3.18			1	
1206	ADJUSTER, SLACK 'P' TYPE	Replace		2.0				
	ADJUSTER, SLACK 'Q' TYPE	Replace		2.0				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
1208	AIR BRAKE CHAMBER 'P' TYPE	Adjust		1.00				
		Replace		1.50				
	AIR BRAKE CHAMBER 'Q' TYPE	Adjust		0.16			1	
		Replace		2.60			1	
	AIR RESERVOIR AND DRAIN COCK							
	AIR LINE TUBING AND FITTINGS	Adjust		0.50				
		Replace		1.00				
	SERVICE AND EMERGENCY COUPLING, PACKING, AND AIR LINE	Adjust		0.33			1	
		Replace		1.75			1	
	SAFETY RELIEF VALVE	Adjust		0.50			1	
		Replace		1.33			1	
	PARKING BRAKE CONTROL VALVE	Adjust		1.50			1	
		Replace		1.00			1	
	FULL FUNCTION VALVE AND RELAY VALVE	Replace		1.00			1	

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	EMERGENCY RELAY VALVE	Replace		1.00			1	
	BRAKE AIR HOSE	Adjust		0.50			1	
		Replace		1.00			1	
	BRAKE INTERLOCK VALVE	Adjust		1.00			1	
		Replace		1.50			1	
13	WHEELS & TIRES							
1311	HUB AND BRAKE DRUM	Replace		3.09			1	
		Repair		2.94				
	HUB AND BRAKE DRUM ASSEMBLY	Replace		2.75			1	
		Repair		2.94				
	TIRE							
	TIRE AND WHEEL ASSEMBLY	Repair		0.50				
		Replace		0.50				
15	FRAME, TOWING ATTACH-MENTS, DRAWBARS, AND ARTICULA-TION SYSTEM							
1503	KINGPIN COUPLER	Replace		.69				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
1507	LANDING GEAR GROUND BOARD	Replace		0.5				
	LANDING GEAR LEG AND SUPPORT SHOE	Replace		.33			1	
	LANDING GEAR HAND CRANK AND DRIVE UNIT							
16	SPRING AND SHOCK ABSORBERS							
1601	LEAF SPRING ASSEMBLY 'P' TYPE	Replace		10.40			1	
	LEAF SPRING ASSEMBLY 'Q' TYPE	Replace		2.50			1	
18	BODY							
1801	MUDFLAP ASSEMBLY	Replace		0.67			1	
1808	HOSE THROUGH ACCESS COVER	Replace		0.50				
		Repair		0.50				
	FILL GAGE STORAGE TUBE CAP	Replace		0.50				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	GROUNDING ROD STORAGE TUBE RETAINING PIN	Replace		0.50				
	1-1/4 IN. HOSE REEL ASSEMBLY	Replace		3.27			1	
		Repair		4.0				
	1-1/2 IN. HOSE REEL ASSEMBLY	Replace		3.27			1	
		Repair		4.0				
	1-1/4 AND 1-1/2 IN. HOSE REEL ASSEMBLIES	Replace		3.27			1	
		Repair		4.0				
	2-1/2 IN. HOSE REEL ASSEMBLY	Replace		3.27			1	
		Repair		4.0				
	2-1/2 IN. HOSE REEL ASSEMBLY	Replace		3.27			1	
		Repair		4.0				
	2-1/2 IN. HOSE COUPLING	Replace		3.27			1	
		Repair		4.0				
	DEADMAN RELEASE VALVE ASSEMBLY	Replace		1.0				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	DEADMAN HOSE REEL ASSEMBLY	Replace		1.0				
	DEADMAN CONTROL HANDLE ASSEMBLY	Replace		1.0				
	DEADMAN CONTROL TUBING ASSEMBLY	Replace		0.50				
	STATIC REEL ASSEMBLY	Repair		0.50				
	HOSE REEL CABINET	Replace		8.0			1	
		Repair		1.0			1	
	HOSE REEL CABINET	Replace		8.0			1	
		Repair		1.0			1	
	HOSE REEL CABINET DOORS	Replace		0.6				
		Repair		1.0				
	HOSE REEL CABINET DOOR LOCK-RELEASE LEVER	Replace		0.30				
		Repair		0.30				
	HOSE REEL CABINET DOOR CYLINDER ASSY	Replace		0.30				
		Repair		0.30				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	STORAGE BOX ASSEMBLY	Replace		1.00				
		Repair		1.00				
	ENGINE AND PUMP CABINET FRAME	Replace		3.00				
		Repair		3.00				
1811	MANHOLE COVER	Adjust		0.50				
		Replace		1.00				
		Repair		0.50				
	GROUNDING STUD	Replace		0.5				
	ENGINE SPLASH GUARD	Replace		.17			1	
	VENT CAP	Replace		0.42			1	
	CARRIER, SPARE WHEEL	Replace		1.0				
		Replace		2.0				
	LADDER, AND DRAIN PIPE	Replace		2.38			1	
22	BODY, CHASSIS, AND HULL ACCESSORY ITEMS							
2210	DECAL	Replace		0.50				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	IDENTIFICATION AND INSTRUCTION PLATES	Replace		0.50				
	REFLECTOR	Replace		0.50				
	HAZARDOUS PLACARD AND BRACKET	Replace		0.50				
29	AUXILIARY GENERATOR AND ENGINE AND CONTROLS							
	ENGINE (LOMBARDINI)	Replace		.78			1	
2911	ENGINE OIL PAN AND DIPSTICK (LOMBARDINI)	Test		2.50			1	
		Replace		3.95			1	
		Repair		4.95			1	
	ENGINE OIL FILTER ADAPTER (LOMBARDINI)	Test		2.50			1	
		Replace		3.95			1	
		Repair		4.95			1	
2916	ENGINE OIL FILTER (ONAN)	Replace		0.10			1	

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	ENGINE OIL COOLER, LINES, AND FITTINGS (ONAN)	Replace		2.00			1	
	ENGINE OIL FILTER (LOMBARDINI)	Replace		2.00				
	ENGINE OIL FILTER HEAD (LOMBARDINI)	Replace		0.67			1	
	ENGINE OIL COOLER, LINES, AND FITTINGS (LOMBARDINI)	Replace		1.50				
	ENGINE OIL PUMP (LOMBARDINI)	Replace		2.00				
	ENGINE OIL SUMP TUBE (LOMBARDINI)	Replace		0.50				
	OIL PRESSURE SWITCH (LOMBARDINI)	Replace		0.30				
	GLOW PLUG (LOMBARDINI)	Replace		.55			1	
2918	AIR INTAKE MANIFOLD	Replace		1.00			1	

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
2932	FUEL INJECTOR LINES AND FITTINGS (LOMBARDINI)	Replace		2.35			1	
	FUEL METERING PUMP (LOMBARDINI)	Replace		2.85			1	
	FUEL INJECTION NOZZLE (LOMBARDINI)	Replace		2.68			1	
	ENGINE FUEL PUMP ASSEMBLY (ONAN)	Replace		1.00				
		Repair		1.00				
	ENGINE FUEL PUMP ASSEMBLY (LOMBARDINI)	Replace		1.00				
		Repair		1.00				
2933	ENGINE INTAKE AIR CLEANER							
	AIR CLEANER ELEMENT	Replace		0.30			1	
	AIR CLEANER RESTRICTION INDICATOR AND TUBE (LOMBARDINI)	Replace		0.30			1	

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	AIR DUCT HOSE (LOMBAR-DINI)	Replace		0.30			1	
	AIR CLEANER RESTRIC-TION INDICATOR AND TUBE (ONAN)	Replace		0.30			1	
	AIR DUCT HOSE AND PIPE COUPLING (ONAN)	Replace		0.30			1	
	ENGINE FUEL TANK	Replace		0.50				
2935	ENGINE FUEL LINES AND FITTINGS (ONAN)	Replace		1.00				
	FUEL TANK LINES AND FITTINGS (LOMBAR-DINI)	Replace		0.50				
2936	LOMBARDINI ELECTRONIC ENGINE CONTROLS, TIER II	Replace		1.00				
2937	FUEL FILTER AND BASE	Replace		0.50				
2939	ENGINE THROTTLE CABLE (LOMBAR-DINI)	Replace		.50			1	

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
2941	MUFFLER AND EXHAUST PIPE	Replace		1.00			1	
	ENGINE EXHAUST MANIFOLD (LOMBAR-DINI)	Replace		2.85			1	
2952	ENGINE EXHAUST MANIFOLD (LOMBAR-DINI)	Replace		1.50				
	ENGINE SHROUDING (ONAN)	Replace		6.43			1	
	ENGINE SHROUDING (LOMBARDINI)	Replace		6.43			1	
2961	ALTERNATOR AND MOUNTING BRACKET	Test		0.50				
		Replace		1.00				
		Repair		1.00				
	ALTERNATOR DRIVE BELT	Replace		0.50				
	ALTERNATOR	Test		.33			1	
		Adjust		0.17			1	
		Replace		0.68			1	
		Repair		1.02			1	

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
2963	ENGINE STARTER AND SOLENOID	Test		2.33			1	
		Replace		2.02			1	
		Repair		2.35			1	
	GLOW PLUG	Replace		0.50			1	
	ENGINE HIGH-TEMP THERMO-STAT CONTROL SWITCH	Test		0.30				
		Replace		0.30				
	BUSS BAR CONNECTOR	Repair		0.50				
	ENGINE ELECTRICAL LEAD ASSEMBLY	Replace		1.00				
		Repair		0.50				
	ELECTRICAL BOX	Replace		1.00				
	FUEL STOP SOLENOID (LOMBAR-DINI)	Test		0.30				
		Replace		0.50				
	ENGINE CONTROL PANEL AND WIRING	Test		0.50				
		Replace		0.50				
		Repair		0.50				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
2967	ENGINE CONTROL PANEL AND WIRING	Replace		2.35			1	
2968	OIL PRESSURE SWITCH AND HOSE (ONAN)	Replace		.55			1	
33	SPECIAL PURPOSE KITS							
3307	VAPOR RECOVERY SYSTEM	Replace		0.67				
		Repair		0.50				
3307	VAPOR INTEGRITY TEST	Replace		8.0				
		Repair		4.0				
42	ELECTRICAL EQUIPMENT							
4216	HOSE REEL CABINET ELECTRICAL LEADS AND CABLE ASSEMBLY	Replace		1.00				
	HOSE REEL CONDUIT ASSEMBLY	Replace		1.00				
	HOSE REEL CONDUIT ASSEMBLY	Replace		1.00				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
47	GAGES (NONELECT-RICAL), WEIGHING AND MEASURING DEVICES							
4702	IN-TANK LIQUID LEVEL GAGE ASSEMBLY	Replace		0.50				
56	FILTER SEPARA-TORS AND PURIFIERS							
5600	PRESSURE RELIEF REGULATING VALVE							
	FILTER/ SEPERATOR							
	AUTOMATIC DRAIN VALVE AND FLOAT	Replace		1.50				
	FILTER/ SEPERATOR OR FILTER ELEMENTS	Replace		1.0				
		Repair		1.0				
72	DISPENSING AND SERVICING EQUIPMENT							
7202	3-IN. PUMP ASSEMBLY	Test		0.17			1	
		Replace		5.35			1	
		Repair		11.03				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	COUPLING, PUMP	Test		0.17			1	
		Replace		5.35			1	
		Repair		11.03				
	4-IN. PUMP ASSEMBLY	Test		0.17			1	
		Replace		5.35			1	
		Repair		11.03				
	VOLUMETRIC METER ASSEMBLY	Replace		.50			1	
7203	VOLUMETRIC METER ASSEMBLY							
	PIPING FRAME ASSEMBLY	Replace		3.62			1	
		Repair		4.20				
	EMERGENCY VALVE AND FLOAT PIPING	Replace		0.17			1	
		Repair		1.0				
	MANIFOLD AND FLANGE ASSEMBLY	Replace		0.17			1	
		Repair		1.0				
	FLOW CONTROL VALVE AND FLANGE ASSEMBLY	Replace		1.50				
	CONTROL VALVE ASSEMBLY	Replace		2.00				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	CONTROL VALVE ASSEMBLY	Replace		2.00				
	MANIFOLD VALVE ASSEMBLY	Replace		1.00				
	MANIFOLD DRAIN VALVE	Replace		1.00				
	CENTRIFUG-AL PUMP TUBING ASSEMBLY	Replace		1.50				
	CENTRIFUG-AL PUMP TUBING ASSEMBLY	Replace		1.50				
	PIPING CONTROL ASSEMBLY	Replace		1.50				
	PIPING CONTROL ASSEMBLY	Replace		1.50				
	PIPING CONTROL ASSEMBLY	Replace		1.50				
	K VALVE	Replace		1.50				
	CABINET PIPING ASSEMBLY	Replace		2.00				
	METER INLET PRESSURE GAGE							

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	FUEL-DISPENSING NOZZLE							
	HOSE REEL PIPING ASSEMBLY	Replace		2.50				
	UNDERWING NOZZLE ASSEMBLY	Replace		1.00				
	OVERWING FUEL NOZZLE	Replace		1.00				
	FUEL NOZZLE	Replace		0.50				
	PRECHECK CONTROL TUBING ASSEMBLY	Replace		1.50				
	ACCUMULATOR, BALL VALVE, NEEDLE VALVE, AND TUBE ASSEMBLY							
	FLOAT VALVE	Replace		1.50				
	EMERGENCY VALVE	Replace		1.50				
	F, B, AND C VALVE ASSEMBLY	Replace		1.00				
	F, B, AND C VALVE ASSEMBLY HANDWHEEL	Replace		1.00				

Table 1. Maintenance Allocation Chart (MAC) - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL				(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT			
			CREW	MAINTAINER	BELOW DEPOT	DEPOT		
			C	F	H	D		
	RECIRCULA-TION ADAPTER ASSEMBLY	Replace		0.50				
	CHECK VALVE ASSEMBLY	Replace		0.50				
	G, R, P, AND M VALVE ASSEMBLY	Replace		1.00				
7204	EMERGENCY VALVE A CONTROL HANDLE	Replace		3.18			1	
76	FIRE FIGHTING EQUIPMENT COMPON-ENTS							
7638	FIRE EXTING-UISHER BRACKET	Replace		0.37			1	
91	CHEMICAL, BIOLOGICAL, AND RADIOLOGIC-AL (CBR) EQUIPMENT							
9120	DECONTAMIN-ATION APPARATUS BRACKET	Replace		0.20			1	
9120	COMPRESSI ON HOSE	Repair		0.20			1	

Table 2. Tools and Test Equipment Requirements.

TOOLS OR TEST EQUIPMENT	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER
1	F	Tool Kit, General Mechanic's Automotive	5180-00-177-7033	SC 5180-90-CL-N26
2	F	Tool Kit, Welder's	5180-00-754-0661	
3	F	Forward Repair System (FRS)	4940-01-533-1621	SC4940-95–E42
4	F	Tool Set, Standard Automotive (SATS)	4910-01-490-6453	SC 4910-95-A81
5	F	Driver, Bearing, Front and Rear Camshaft and Main Drive	5120-00-125-4402	420-0326
6	F	Driver, Oil Seal Rear Crankshaft	5120-00-125-4411	420-0250
7	F	Gage, Compression Test	4910-00-870-6283	10699180

Table 3. Remarks.

REMARK CODE	REMARKS
A	REPAIR AT FIELD LEVEL WITH AXLE INSTALLED ON TRAILER.
B	TEST CONSISTS OF INSPECTION FOR LEAKAGE.

END OF WORK PACKAGE

FIELD MAINTENANCE
COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS

INTRODUCTION

Scope

This Work Package lists components of the end item and basic issue items for the semitrailers to help you inventory items required for safe and efficient operation.

General

These Components of End Item and Basic Issue Items Lists are divided into the following sections:

Section I. Integral Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between accounts. Illustrations are furnished to assist you in identifying the items.

Section II. Basic Issue Items. These are the minimum essential items required to place the semitrailer in operation, to operate it, and to perform emergency repairs. Although shipped separately, packaged BII must be with the semitrailer during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

Explanation of Columns

The following provides an explanation of columns found in the tabular listings.

Column (1) - Illustration Number (Illus Number): This column indicates the number of the illustration in which the item is shown.

Column (2) - National Stock Number: The National stock number assigned to the item and will be used for requisitioning purposes.

INTRODUCTION - Continued

Column (3) - Description: Indicates the National item name and, if required, a minimum description to Identify and locate the item. The last line for each item indicates the FSCM (in parenthesis) followed by the part number. If item needed differs for different models of this equipment, the model is shown under the “Usable On Code" heading in this column. These codes are identified as:

Table 1. Usable On Codes.

Code	Used on
AOB	M969A1P1
AOC	M969A2P1
AOE	M967A1P1
C89	M969A2
C90	M967A1
C91	M970A1
C92	M969A1

Column (4) - Unit of Measure (U/M): Indicates the measure used in performing the actual operational/ maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in., pr).

Column (5) - Usable On Code: Indicates the model the item is used on.

Column (6) - Quantity Required (Qty. Rqr): Indicates the quantity of the item authorized to be used with/on the equipment.

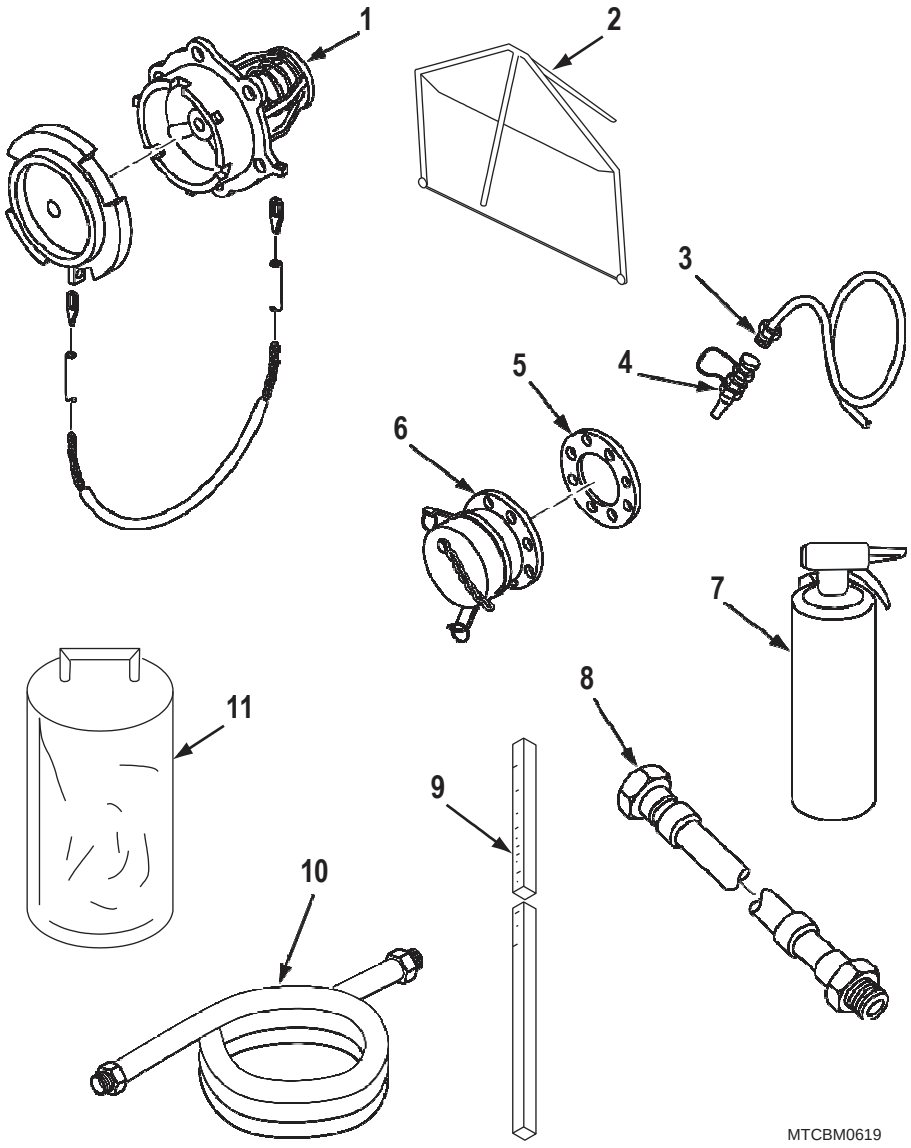

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Table 2. Components Of End Items (COEI) List.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER (NSN)	(3) DESCRIPTION, PART NUMBER/ (CAGEC)	(4) USABLE ON CODE	(5) U/I	(6) QTY RQR
1	4930-00-333-6573	ADAPTER, OVERWING (tool box) AE96673R(00624)		EA	1
2	5140-00-772-4142	BAG, TOOL (tool box) 5-3-62(81337)		EA	1
3	4730-01-065-9388	COUPLING, FUEL SAMPLING (tool box) AE96920E(00624)		EA	1
4	4720-01-064-8820	COUPLING, FUEL SAMPLING (tool box) AE96924E(00624)		EA	1
5	4720-01-072-8355	GASKET (use with coupling 11668074) 11668581(19207)		EA	1
6	4730-01-088-8675	COUPLING, HALF, QUICK DISCONNECT (tool box) 897N(0UYK1)		EA	1
7	4210-00-808-4544	EXTINGUISHER, FIRE (rear and side bracket) AA393-B2C(58536)		EA	2
8	4720-01-072-8355	DUPLEX HOSE, RUBBER 11668581(19207)		EA	2
9	5210-01-054-9934	GAGE, STICK (stowage tube) 11685988(19207)		EA	1
10	4720-00-461-3796	HOSE ASSEMBLY 1-1/2 in. X 50 ft M6615-I-B-5000N(81349)		EA	1
11	5340-01-290-2727	COVER, ACCESS (on extinguishers) 67637(03670)		EA	2
12	8105-01-283-571	BAG, TEXTILE 12275300(19207)		EA	2
13	4720-00-461-3797	HOSE ASSEMBLY 2-1/2 in. X 50 ft 11597598(19207)		EA	1
14	4720-01-058–6032	HOSE ASSEMBLY 1-1/4 in. X 50 ft 11685953(19207)		EA	1
15	4720-01-096-4390	HOSE, TRANSFER (in hose trough) 11685834(19207)		EA	1
16	5330-00-899-4509	GASKET AA59326-9(58536)		EA	2
17	4730-01-536-0851	PLUG, QUICK DISCONNECT MS27029-17(1U339)		EA	2
18	4720-01-087-5876	HOSE, TRANSFER (in hose trough) 11685835(19207)		EA	2

Table 2. Components Of End Items (COEI) List - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER (NSN)	(3) DESCRIPTION, PART NUMBER/ (CAGEC)	(4) USABLE ON CODE	(5) U/I	(6) QTY RQR
19	4730-00-640-6156	CAP QUICK DISCONNECT AA59326IX-9(58536)		EA	2
20	5330-00-899-4509	GASKET AA59326-9(58536)		EA	4
21	4730-00-640-6188	PLUG, QUICK DISCONNECT AA59326X19(5856)		EA	2
22	4930-01-022-7901	NOZZLE, FUEL AND OIL SERVICING P2506-03-200(76364)		EA	1
23	4730-00-268-7479	BUSHING, PIPE SHOULDER (tool box) MS14315-22X(96906)		EA	1
24	5340-01-170-4999	DUST CAP (tool box) 12275443(19207)		EA	1
25	2910-01-170-4937	FILLER NECK PROTECTOR (tool box) (use with bushing MS14315-22X only) 12275446(19207)		EA	1
26	4730-01-094-0466	STRAINER (tool box) 12275444(19207)		EA	1
27	4930-01-194-8324	NOZZLE, CLOSED-CIRCUIT (tool box) 13219E0486(97403)		EA	1
28	4730-01-091-9010	CONNECTOR, ACTUATOR (tool box) (use with nozzle 13219E0486 only) GTP-1510(32218)		EA	1
29	4730-01-084-5226	STRAINER (tool box) (use with nozzle 13219E0494 only) GTP-1534(32218)		EA	1
30	5340-01-050-7059	PADLOCK SET, W/CLEVIS AND CHAIN, COMPOSED OF 2 PADLOCKS AND 2 KEYS AA59486-1AB05S2(58536)		EA	1
31	4730-00-951-3293	REDUCER, QUICK DISCONNECT (tool box) AA59326A/12-1-A-2(58536)		EA	1
32	5330-00-612-2414	GASKET REDUCER (tool box) AA59326-G6(58536)		EA	1
33	4730-00-951-3295	REDUCER, QUICK DISCONNECT (tool box) AA59326/12-3-A-2(58536)		EA	1

Table 2. Components Of End Items (COEI) List - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER (NSN)	(3) DESCRIPTION, PART NUMBER/ (CAGEC)	(4) USABLE ON CODE	(5) U/I	(6) QTY RQR
34	5330-00-899-4509	GASKET, REDUCER (tool box) AA59326-9(58536)		EA	2
35	4730-01-484-0560	REDUCER, QUICK DISCONNECT (tool box) AA59326XI-1-9(58536)		EA	1
36	5975-01-050-5707	ROD, GROUND (stowage tube) 13219E0462(19207)		EA	1
37	1290-01-096-9304	SLEEVE, HOSE (tool box) 12275301(19207)		EA	1

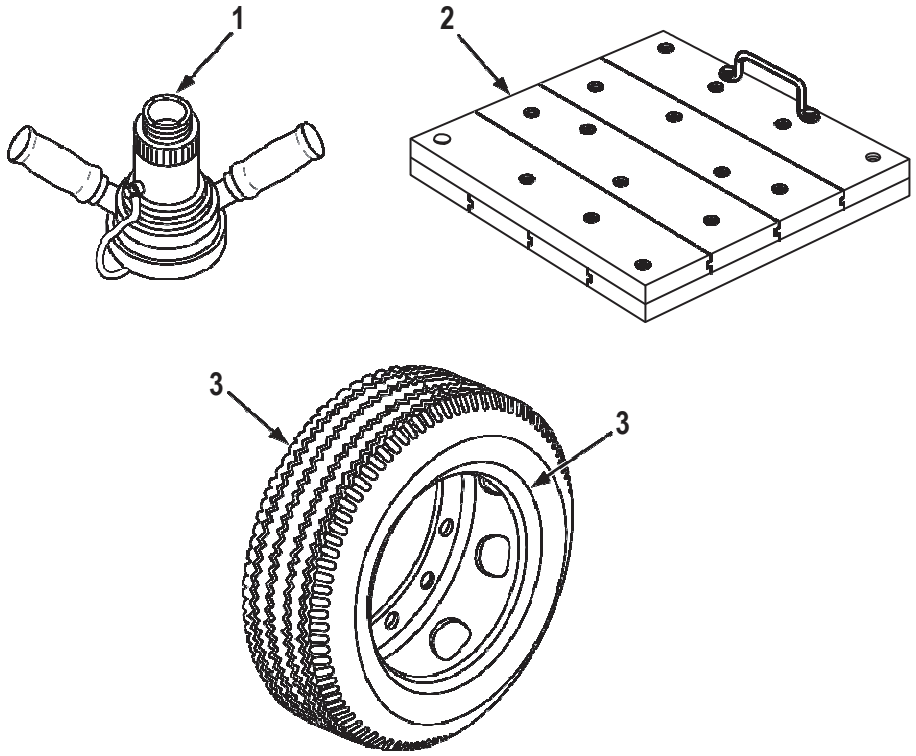

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Table 3. Basic Issue Items (BII) List.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER (NSN)	(3) DESCRIPTION, PART NUMBER/ (CAGEC)	(4) USABLE ON CODE	(5) U/I	(6) QTY RQR
1	1560-00-949-2087	Adapter Pressure Fuel Servicing MS24484-2(96906)		EA	1
2	2510-00-741-7585	Board, Ground (at landing legs) 7417585(19207)		EA	2
3	2610-00-051-9450	Tube, Inner, Pneumatic (rear bracket) 11.00-20/TR444/ON CENTER(81348)		EA	1
3	2610-01-262-8677	Tire, Spare (rear bracket) SAEJ2014 REV.EC95(19207)		EA	1
5	4235-01-308-5150	Sorbent, Oil (suitable drip absorber) MAT214(IJA49)		EA	1

END OF WORK PACKAGE

FIELD MAINTENANCE
EXPENDABLE/DURABLE ITEMS LIST (EDIL)

INTRODUCTION

Scope

This work package lists expendable and durable items that you will need to operate and maintain the semitrailers. This list is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items), CTA 50-909, Field and Garrison Furnishings and Equipment or CTA 8-100, Army Medical Department Expendable/ Durable Items.

Explanation of Columns

Column (1) - Item Number. This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g., Use brake fluid (WP 0098, Item 5)). This number is assigned to the entry in the listing and is referenced in the "Initial Setup" of maintenance paragraphs or narrative instructions to identify the item (e.g., Use brake fluid (WP 0098, Item 5)

Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item (includes as applicable: C = Crew; F = Maintainer or ASB; H = Below Depot or TASMG; D = Depot).

Column (3) - National Stock Number (NSN). This is the NSN assigned to the item which you can use to requisition it.

Column (4) - Item Name, Description, Part Number/(CAGEC). This column provides the other information you need to identify the item. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).

Column (5) - U/I. Unit of Issue (U/I) code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Table 1. Expendable/Durable Supplies and Materials List.

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER (NSN)	(4) ITEM NAME, DESCRIPTION, PART NUMBER/ (CAGEC)	(5) U/I
1	F	7920-00-061-0038	BRUSH, SCRUB 7920-00-061-0038 (83421)	EA
2	F		BRUSH, STIFF FIBER	
3	F	5340-00-450-5718	CAP AND PLUG SET 10935405 (19207)	EA
4	F	5350-00-221-0872	CLOTH, ABRASIVE Crocus 50 Sheets ANSI B74.18 (80204)	PG
5	F	7920-01-004-7847	CLOTH, CLEANING SAE AMS 3819 CL 1GRA (05AY8)	RO
6	F	8030-01-044-5034	COMPOUND, ANTISIEZE AMS2518 (81343)	LB
7	F	8030-01-414-7423	CORROSION PREVENTIVE, Fingerprint Remover MIL-C-15074 (81349)	BX
8	F		FUEL OIL, DIESEL, Arctic, DF-A Grade VVF800GRADEDFAAR (81348)	
9	F	9140-00-286-5282	FUEL OIL, DIESEL, Arctic, DF-A Grade 5-Gallon Can	CN
10	F		FUEL OIL, DIESEL, Regular, DF-2 Grade AA52557-2 (58536)	CN
11	F	9140-00-286-5295	FUEL OIL, DIESEL, Regular, DF-2 Grade 5-Gallon Can	CN
12	F	9150-00-985-7247	GREASE, AIRCRAFT 6-1/2 Pound Can MIL-PRF-23827 (81349)	CN
13	F		GREASE, AUTOMOTIVE AND ARTILLERY	
14	F	9150-01-197-7690	GREASE, AUTOMOTIVE AND ARTILLERY 1-3/4 Pound Can M-10924-C (81349)	CN
15	F	9150-01-197-7689	GREASE, AUTOMOTIVE AND ARTILLERY 6-1/2 Pound Can M-10924-D (81349)	CN
16	F	9150-00-188-9858	LUBRICATING OIL, OE/HOO 30W 5-Gallon Can M2104-3-30W (81349)	CN
17	F	9150-00-889-3523	LUBRICATING OIL, Preservative, Corrosion Inhibited M46002-01 (81349)	QT
18	C	9150-01-152-4118	OIL, LUBRICATING, INTERNAL COMBUSTION ENGINE, TACTICAL SERVICE 5-Gallon Can MIL-PRF-2104 (81349)	CN
19	F	6505-00-133-8060	PETROLATUM, White	CN
20	F	7920-00-205-1711	RAG, WIPING Cotton and Cotton Synthetic, 50-Pound Bale 7920-00-205-1711 (64067)	BE

Table 1. Expendable/Durable Supplies and Materials List - Continued.

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER (NSN)	(4) ITEM NAME, DESCRIPTION, PART NUMBER/ (CAGEC)	(5) U/I
21	F	8030-01-088-8140	SEALANT, ADHESIVE Loctite MIL-S-46163 (81349)	BX
22	F	8030-01-054-0740	SEALING COMPOUND, Pipe, Anaerobic, with Teflon, 50 Milliliter Tube 592-31 (05972)	BX
23	F	8520-00-228-0598	SOAP, Toilet, Liquid P-S 624 Type 1 (81348)	BX
24	F	8950-00-292-9611	SODA, BAKING UR 162	BX
25	F	6850-01-474-2317	SOLVENT, CLEANING COMPOUND TYPE II MIL-PRF-680 (81349)	CO
26	F	6850-01-474-2319	SOLVENT, CLEANING COMPOUND TYPE II 1-Gallon Can	GL
27	F	5975-00-984-6582	STRAP, TIEDOWN Electrical 100 Each (96906)	HD
28	F	9905-00-537-8954	TAG, MARKER 50 Each 9905-00-537-8954 64067	BP
29	F	8030-00-889-3535	TAPE, ANTISEIZE 1/2 in. Width, 260 in. Roll MIL-T-27730A (81349)	EA
30	F	5970-00-644-3167	TAPE, INSULATION, ELECTRICAL 85-Foot Roll TL83 (80063)	RO

END OF WORK PACKAGE

FIELD MAINTENANCE
TOOL IDENTIFICATION LIST (TIL)

SCOPE

This work package lists all common tools and supplements and special tools/fixtures needed to maintain the Semitrailer Tank.

EXPLANATION OF COLUMNS IN THE TOOL IDENTIFICATION LIST

Column (1) Item No. This number is assigned to the entry in the list and is referenced in the initial setup to identify the item (e.g., Extractor (WP 0090, Item 32)).

Column (2) Item Name. This column lists the item by noun nomenclature and other descriptive features (e.g., Gage, belt tension).

Column (3) National Stock Number (NSN). This is the National Stock Number (NSN) assigned to the item; use it to requisition the item.

Column (4) Part Number/(CAGEC). Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity) which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items. The manufacturer's Commercial and Government Entity Code (CAGEC) is also included.

Column (5) Reference. This column identifies the authorizing supply catalog or RPSTL for items listed in this work package.

Table 1. Tool Identification List.

(1) ITEM NO.	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER (NSN)	(4) PART NUMBER /(CAGEC)	(5) REFERENCE
1	Bushing, Removal Tool	-	00NS2	SATS CL 4910-95A81
2	Crimping Tool, Terminal	-	KTC S0159 00NS2	SATS CL 4910-95A81
3	Caliper, Micrometer, Inside	-	KTC S0998 00NS2	SATS CL 4910-95A81
4	Caliper, Vernier 0-6 in.	-	KTC S0999 00NS2	SATS CL 4910-95A81
5	Chisel, Grinder	-		
6	Compressor Unit, Reciprocating	-	KTC S0157 00NS2	SATS CL 4910-95A81
7	Drill, Electric, Portable	-	KTC S0189 00NS2	SATS CL 4910-95A81

Table 1. Tool Identification List - Continued.

(1) ITEM NO.	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER (NSN)	(4) PART NUMBER /(CAGEC)	(5) REFERENCE
8	Drill Set, Twist	-	KTC S0194 00NS2	SATS CL 4910-95A81
9	Gage, Test	-		
10	Gloves, Chemical and Oil Protective	8415-00-009-1900	N36 (86523)	
11	Gloves, Welder's	8415-00-268-7859	A-S-50022 58536	
12	Igniter, Friction	5120-00-965-0326	5-13-2003-55-81337	
13	Jack, Dolly Type, Hydraulic: 10 Ton	4910-00-289-7833	93660 36251	
14	Pliers, Brake Repair	-		SATS CL 4910-95A81
15	Pliers, Locking Ring	-	KTC S0258	SATS CL 4910-95A81
16	Puller Kit, Mechanical: Gear and Bearing	-	KTC S0269 00NS2	SATS CL 4910-95A81
17	Riveter, Blind Hand: 3/32 in., 1/8 in., 5/32 in., and 3/18 in. Diameters	-	KTC S0700 00NS2	SATS CL 4910-95A81
18	Stand, Jack	-		
19	Tool Kit, General Mechanic's Automotive	5180-00-177-7033	SC5180-90-CL-N26 50980	
20	Tool Kit, Welder's	5180-00-754-0661	SC5180-90-N39 50980	
21	Torch Set, Cutting and Welding	3433-00-294-6743	MIL-T-13880 81349	
22	Wrench Set, Socket: 3/4 in. Drive, Wheel-Bearing	-	KTC S0661 00NS2	SATS CL 4910-95A81
23	Wrench Set, Socket: 3/4 in. Drive	-	KTC S0961 00NS2	SATS CL 4910-95A81

Table 1. Tool Identification List - Continued.

(1) ITEM NO.	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER (NSN)	(4) PART NUMBER /(CAGEC)	(5) REFERENCE
24	Wrench, Strap, Pipe: 1-6 in. Diameter	5120-00-776-1840	9171739 18876	
25	Wrench, Torque: 1/2 in. Drive, 0-250 lb ft Capacity	-	KTC S0991 00NS2	SATS CL 4910-95A81
26	Wrench, Torque: 3/4 in. Drive, 0-600 lb ft Capacity	-	KTC S0988 00NS2	SATS CL 4910-95A81
27	Wrench, Torque Dial: 3/8 in. Drive, 0-300 lb in. Capacity	-	KTC S0987 00NS2	SATS CL 4910-95A81

END OF WORK PACKAGE

FIELD MAINTENANCE
MANDATORY REPLACEMENT PARTS

Scope

This work package includes a list of all mandatory replacement parts needed to maintain the Semitrailer Tank and is included for that purpose only. These are items that must be replaced during maintenance whether they have failed or not.

Explanation of Columns in the Mandatory Replacement Parts (MRP) List

Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the Initial Setup to identify the item (e.g., Pin, Cotter (WP 0119, Item 120).

Column (2) - Part Number/(CAGEC). This column indicates the primary number used by the manufacturer (individual, company, firm, corporation, or government entity) to identify an item or range of items. The part number will be followed by the Contractor and Government Entity Code (CAGEC) in parentheses only when the CAGEC is required to requisition the part.

Column (3) - National Stock Number. This column is the National Stock Number (NSN) assigned to the item. Use it to request or requisition the item.

Column (4) - Nomenclature. This column contains the name or description of the parts as listed in the Initial Setup of the procedure under the heading "Materials/Parts".

Column (5) - Quantity. This column gives the Quantity (QTY) required for the total CBPS system repair or rebuild. The quantity required for each task is given in the initial setup prior to the item number when the quantity is greater than one.

Table 1. Mandatory Replacement Parts (MRP) List.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
1		-	TIE, CABLE	
2	22096 0DT23	5315-00-240-4265	PIN, LOCK	1
3	014224 38205	5331-20-000-5244	O-RING	1
4	018238 52173	5331-01-560-1782	O-RING	1
5	055019 87405	5330-00-778-7248	GASKET	5
6	100396 0BUN9	5330-01-423-9474	GASKET, BASE	5
7	100397 0BUN9	5330-01-423-9479	GASKET	5
8	10060-01 92967	5306-01-098-7197	BOLT, U	8

Table 1. Mandatory Replacement Parts (MRP) List - Continued.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
9	10871852-2 19207	4730-00-825-0616	COUPLING, CLAMP, PIPE	1
10	10871869 19207	5330-00-978-9575	SEAL, NONMETALLIC	3
11	10871869-1 19207	5330-00-930-5953	SEAL, NONMETALLIC	7
12	10910595 19207	5330-00-089-2442	GASKET	1
13	10963375 19207	-	GASKET	1
14	11597619 19207	5330-01-065-8850	GASKET	1
15	1160915 19207	5330-01-060-6890	GASKET	3
16	11611883 19207	5330-00-168-2195	SEAL, NONMETALLIC	6
17	11621224-2 19207	5330-01-065-8849	GASKET	1
18	11662296-17 19207	5331-00-205-3583	O-RING	4
19	11662296-24 19207	5315-00-482-1586	PIN, ANCHOR, RETURN SPRING	4
20	11668338 19207	5940-01-088-6840	STUD, GROUNDING	1
21	11670914 19207	5330-01-081-5070	GASKET	3
22	11670915 19207	5330-01-060-6890	GASKET	4
23	11685873 19207	5330-01-062-5633	GASKET	2
24	11685880 19207	2940-01-061-5734	FILTER, ELEMENT, FLUID	1
25	11685919 19207	5330-01-070-4850	GASKET	2
26	11685920 19207	5330-01-066-2492	GASKET	2
27	11685921	5330-01-065-6382	GASKET	2

Table 1. Mandatory Replacement Parts (MRP) List - Continued.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
	19207			
28	11685962 19207	5330-01-065-6381	GASKET	1
29	11685964 19207	5330-01-067-7066	GASKET	1
30	1200.219 2X179	-	O-RING	1
31	122-0325 44940	2910-00-125-5600	FILTER ELEMENT, FLUID	1
32	122-0326 44940	2910-00-125-5601	FILTER, FLUID	1
33	1225B496 78500	3120-00-255-6042	BUSHING, SLEEVE	4
34	12275222 19207	5340-01-094-9016	CLIP, RETAINING	1
35	122752231 19207	-	RIVET	1
36	12275380 19207	5330-01-096-1874	GASKET	1
37	12275382 19207	5330-01-098-2028	GASKET	2
38	12275562-5 19207	-	STRAP, WEBBING	2
39	1229-T-4102 78500	5325-01-499-3380	RING, RETAINING	2
40	12380153-4 19207	-	GASKET, PAPER	2
41	13-50641 82366	5310-01-066-1822	WASHER, LOCK	1
42	13228E1772-2 97403	5330-01-398-8738	GASKET	1
43	140-0584 44940	5330-00-971-5752	GASKET	1
44	15-50641 82366	5310-01-004-7933	WASHER, LOCK	26
45	1509 06721	5330-00-172-1919	PACKING, PREFORMED	

Table 1. Mandatory Replacement Parts (MRP) List - Continued.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
46	152064-022 08712	5331-01-246-0632	O-RING	1
47	15265CB 13226	-	GASKET	1
48	1665311C1 89346	2940-00-586-4792	FILTER ELEMENT, FLUID	1
49	17-50641 82366	5310-01-065-6251	WASHER, LOCK	10
50	200084 0BUN9	5310-01-423-3728	WASHER, LOCK	12
51	200273 0BUN9	5310-01-423-3724	WASHER, LOCK	7
52	201201-014 0DT23	5331-01-053-0218	O-RING	1
53	201201-145 0DT23	5331-01-053-0219	O-RING	1
54	2258-Q-615 78500	5360-01-158-1974	SPRING, HELICAL, EXTE	4
55	2258-W-803 78500	5360-01-499-3396	SPRING, HELICAL, COMP	2
56	23MS35338-46 80045	5310-00-637-9541	WASHER, LOCK	14
57	247-53910 82366	5331-01-085-7724	O-RING	1
58	2474-GA 2567	5330-01-060-7266	GASKET SET	1
59	251262 H0001	5310-00-880-7744	NUT, PLAIN, HEXAGON 5/16-18	4
60	25217-363 25567	5330-01-076-9864	SEAL, OIL	1
61	25227-363 25567	5331-01-504-6856	O-RING	1
62	25227-689 25567	5330-01-060-9610	SEAL, PLAIN ENCASED	2
63	27-50671 82366	5310-01-076-3052	WASHER, LOCK	6
64	283.4580.001	5330-01-452-7384	GASKET	1

Table 1. Mandatory Replacement Parts (MRP) List - Continued.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
	2X179			
65	2EL438 45152	5325-01-061-0710	RING, RETAINING	4
66	314080-RED 38205	5310-20-000-5254	WASHER, LOCK	3
67	314080-RED 38205	5330-20-000-5235	SEAL, NONMETALLIC	1
68	314345 52173	-	SEAL	1
69	330-3056 26151	5330-01-280-5827	GASKET	2
70	3310558 45152	5330-01-071-8179	GASKET	4
71	3560BN 13226	5330-01-134-1986	GASKET	1
72	37-03 92967	5310-01-099-6539	NUT, SELF-LOCKING, HEXAGON	4
73	38084-C 76364	5310-01-077-9647	WASHER, LOCK	8
74	38683-207 25567	5330-01-060-9614	GASKET	1
75	404942 09310	5331-01-090-5568	O-RING	1
76	407804 09310	5330-010845969	PACKING, PREFORMED	2
77	4156-GA 25567	5330-01-061-1749	GASKET	1
78	4256-L-630 76364	5305-01-079-6771	SCREW, CAP HEXAGON	16
79	4420.019 2X179	5330-01-395-0878	GASKET	1
80	4501-110 2X179	5330-01-502-8447	GASKET	1
81	4580.170 2X179	-	GASKET	1
82	4670-019 2X179	5330-01-452-7382	GASKET, COPPER	4

Table 1. Mandatory Replacement Parts (MRP) List - Continued.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
83	4670.005 2X179	5330-01-340-8267	GASKET	1
84	4670.023 2X179	-	GASKET, COPPER	1
85	479136 72850	5330-00-763-9322	GASKET	1
86	479729 72850	4730-00-893-6402	STRAINER, FUEL	1
87	500361-8 4Q4K2	5310-01-183-6854	WASHER, LOCK	20
88	50995152 3DGR3	5310-01-556-1400	NUT, SELF-LOCKING	4
89	5400761000 76371	4730-01-334-5094	COUPLING, PIPE	2
90	54206005 00843	5330-01-406-3902	GASKET	1
91	560.4420.020 2X179	5330-01-351-7676	GASKET	3
92	5939841 73331	5330-00-353-0959	FELT, MECHANICAL	2
93	5996-R 76364	-	PIN, GROOVE	1
94	6-1-5866-17 81337	5310-01-130-9065	WASHER, LOCK	8
95	625.4490.086 2X179	5330-01-459-2294	GASKET	1
96	625.4501.025 2X179	5330-01-452-7383	GASKET	1
97	625.4601.045 2X179	5330-01-365-9659	GASKET	1
98	65103-A-992NON-ASBESTOS 76364	5330-01-074-6882	PACKING, PREFORMED	1
99	65146-K-A993 76364	5330-00-400-3513	PACKING, PREFORMED	3
100	658-248-910 76364	5331-01-450-1274	O-RING	1

Table 1. Mandatory Replacement Parts (MRP) List - Continued.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
101	6581-243-925 76364	5331-01-074-1997	O-RING	1
102	6593L 76364	5330-00-889-5483	PACKING, PREFORMED	1
103	6595-N-910 76364	5330-01-381-2809	SEAL, PLAIN ENCASED	1
104	6596-B 76364	5331-01-076-9342	O-RING	1
105	66150-N 76364	5330-01-073-5007	SEAL, VALVE	1
106	6686-N-700 76364	5330-00-346-2732	GASKET	2
107	7411-N 76364	-	BEARING, BOTTOM	1
108	755001111E 3D6E9	5342-01-271-6326	RETAINER, SPECIAL	4
109	7565.004 2X179	5310-01-324-8327	WASHER, LOCK	6
110	7565.007 2X179	5310-01-340-8352	WASHER, LOCK	9
111	7565.011 2X179	5310-01-324-8343	WASHER, LOCK	1
112	76985 24975	5210-00-432-3959	NUT, SELF-LOCKING, HEX 5/8-18	1
113	7959-D 76364	-	PIN, COTTER	1
114	821-0010 44940	5305-01-050-3733	SCREW, SELF-LOCKING	3
115	8335.255 2X179	-	GASKET	1
116	8338566 19207	5935-00-572-9180	SHELL, CONNECTOR	3
117	849-00 92967	5310-01-098-7827	NUT, SELF-LOCKING	20
118	850-0040 44940	5310-01-009-6570	WASHER, LOCK	2
119	850-0050	5310-01-060-9104	WASHER, LOCK	2

Table 1. Mandatory Replacement Parts (MRP) List - Continued.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
	44940			
120	853-0013 44940	5310-01-077-9650	WASHER, LOCK	6
121	853-0016 44940	5310-01-050-1309	WASHER, LOCK	3
122	856-0006 44940	5310-01-060-7182	WASHER, LOCK	1
123	9.1200.087 2X179	5331-01-458-2589	GASKET	1
124	9.1200.226 2X179	-	O-RING	1
125	904.4730.533 2X179	5330-01-458-5601	GASKET	2
126	90715A145 39428	5310-01-508-5774	NUT, SELF-LOCKING, HEX	8
127	920118 13226	5331-00-897-5859	O-RING	1
128	9562-0133 1R5C8	5310-01-502-8323	NUT, SELF-LOCKING	4
129	9Q5864 13226	5315-01-087-8697	PIN, STRAIGHT, HEADLESS	1
130	9Q5960 13226	5310-01-541-1251	NUT, SELF-LOCKING	1
131	9Q5961 13226	5310-01-486-4256	WASHER, LOCK	1
132	A52481-10 58536	5330-00-948-0704	GASKET	1
133	A52484-2 58536	5330-00-090-2128	PACKING, PREFORMED	2
134	AA50553-3-1-P-02-S 58536	5975-00-642-7261	LOCKNUT, ELECTRICAL	5
135	AA52598-B-114.3 58536	4730-00-142-1590	COUPLING, CLAMP, PIPE	2
136	AA59326-9 58536	5330-00-899-4509	GASKET	2
137	AA59326-G6 58536	5330-00-612-2414	GASKET	1

Table 1. Mandatory Replacement Parts (MRP) List - Continued.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
138	AE18628-008 00624	5330-01-063-8526	PACKING, PREFORMED	1
139	C01100011 38205	5310-20-000-5251	WASHER, LOCK	10
140	C0850200500 15434	5310-01-321-3478	WASHER, LOCK	1
141	C0850200800 15434	5310-01-321-4088	WASHER, LOCK	1
142	C22710190 38205	5310-20-000-5247	NUT, SELF-LOCKING	4
143	ED0021750400-S 2X179	2940-01-324-5153	FILTER ELEMENT, FLUID	1
144	F2738-A01-3-1-24 81348	5340-01-469-7199	SEAL, ANTIPILFERAGE	1
145	GF20995C32	-	WIRE, LOCK	1
146	GF35338-43	-	WASHER, LOCK	1
147	J04-15991 25567	5310-01-502-8759	WASHER, LOCK	8
148	J06-17000 25567	5310-01-533-4987	WASHER, LOCK	20
149	J0815991 25567	5310-00-470-5974	WASHER, LOCK	4
150	K235 3D6E9	5315-01-092-1953	PIN, COTTER	4
151	K2416 78500	5315-00-010-3389	PIN, COTTER	1
152	KITSTNGS 78500	5330-01-047-9367	SEAL, PLAIN	4
153	L030075PT0 79154	4730-00-855-4919	COUPLING, CLAMP, PIPE	1
154	L040075PT0 79154	4730-00-855-4916	COUPLING, CLAMP, PIPE	2
155	LOCITE 51817 05972	5330-01-453-5497	GASKET	1
156	M10HM116-4 4Q4K2	5306-01-337-6972	BOLT, FINNED NECK	10

Table 1. Mandatory Replacement Parts (MRP) List - Continued.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
157	M16WJ100 62707	5360-01-241-6961	SPRING, HELICAL	4
158	M24243/1-B602 81349	5320-00-408-6073	RIVET, BLIND	4
159	M45913/1-10CG5C 81349	5310-00-269-4040	NUT, SELF-LOCKING, HEX 5/8-11	18
160	M45913/1-10FG5C 81349	5310-00-225-6408	NUT, SELF-LOCKING	28
161	M45913/1-4CG5C 81349	5310-00-088-1251	NUT, SELF-LOCKING	12
162	M45913/1-5CG5C 81349	5310-00-984-3806	NUT, SELF-LOCKING HEX 3/8-18	8
163	M45913/1-5FS3 81349	5310-00-927-3877	NUT, SELF-LOCKING, HEX 5/16-24	2
164	M45913/1-6CG5C 81349	5310-00-087-4652	NUT, SELF-LOCKING	8
165	M45913/1-8CG5C 81349	5310-00-225-6993	NUT, SELF-LOCKING HEX 1/2-13	8
166	M45913/2-6FG5C 81349	5310-00-959-1488	NUT, SELF-LOCKING	57
167	MC3686-37 79500	5310-00-261-7340	WASHER, LOCK	8
168	MP0-0113 26697	5325-01-062-1009	RING, RETAINING	16
169	MS16562-82 80205	5315-00-903-4322	PIN, SPRING	4
170	MS171600 96906	5315-01-100-7130	PIN, SPRING	1
171	MS17829-3C 80205	5310-00-689-3877	NUT, SELF-LOCKING	8
172	MS21042-4	-	NUT, SELF-LOCKING	2
173	MS21044-N8 80205	5310-00-877-5795	NUT, SELF-LOCKING, HEX 1/2-20	4
174	MS21044N4 80205	5310-00-877-5796	NUT, SELF-LOCKING, HEX 1/4-28	4
175	MS21045-08 96906	5310-00-889-2549	NUT, SELF-LOCKING HEX 8-32	2

Table 1. Mandatory Replacement Parts (MRP) List - Continued.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
176	MS21083F-N4 96906	-	NUT, SELF-LOCKING 1/4-28	2
177	MS21083N08 80205	5310-00-941-6019	NUT, SELF-LOCKING, HEX 8-32	2
178	MS21083N3 80205	5310-00-902-6676	NUT, SELF-LOCKING 10-32	8
179	MS24665-300 80205	5315-00-234-1863	PIN, COTTER	1
180	MS24665-302 80205	5315-00-234-1864	PIN, COTTER	1
181	MS24665-353 80205	5315-00-839-5822	PIN, COTTER	1
182	MS27183-17 96906	5310-00-809-5997	WASHER, LOCK	8
183	MS29512-10	-	GASKET	1
184	MS29513-153 81343	5331-00-875-8288	O-RING	1
185	MS29513-234 81343	5331-00-251-9367	O-RING	2
186	MS29513-240 81343	5331-00-291-3070	O-RING	2
187	MS29513-265 81343	5331-00-252-6047	O-RING	1
188	MS35333-39 80205	5310-00-576-5752	WASHER, LOCK	4
189	MS35333-40 80205	5310-00-550-1130	WASHER, LOCK	4
190	MS35333-46 96906	5310-00-543-4385	WASHER, LOCK	1
191	MS35338-42 80205	5310-00-045-3299	WASHER, LOCK	4
192	MS35338-43 80205	5310-00-045-3296	WASHER, LOCK	14
193	MS35338-44 80205	5310-00-582-5965	WASHER, LOCK	4
194	MS35338-44 80205	5310-00-582-5965	WASHER, LOCK	4

Table 1. Mandatory Replacement Parts (MRP) List - Continued.

ITEM NO.	PART NUMBER /(CAGEC)	NATIONAL STOCK NUMBER (NSN)	NOMENCLATURE	QTY
195	MS35338-45 80205	5310-00-407-9566	WASHER, LOCK	12
196	MS35338-46 96906	5310-00-637-9541	WASHER, LOCK	2
197	MS35338-50 80205	5310-00-820-6653	WASHER, LOCK	
198	MS35489-40X 96906	5325-01-257-1727	GROMMET,NONMETALLIC	2
199	MS35756-11 80205	5315-00-616-5523	KEY, WOODRUFF	1
200	MS51922-1 96906	5310-00-088-1251	NUT, SELF-LOCKING HEXAGON	1
201	MS51922-17 96906	5310-00-087-4652	NUT, SELF-LOCKING	15
202	MS51922-18 96906	5310-00-914-6028	NUT, SELF-LOCKING, HE	9
203	MS51967-2 96906	5310-00-761-6882	NUT, PLAIN, HEXAGON 1/4-20	1
204	N13048 06721	2530-00-270-3878	HOOK, CHAIN, S	1
205	R000573 78500	5310-01-116-4765	WASHER, LOCK	1
206	STG75 03743	5331-00–846-0182	O-RING	5
207	T75-2 79154	5330-00-978-9575	SEAL, NONMETALLIC	1
208	WA18C 78500	5310-00-296-2672	WASHER, LOCK	10
209	XB-SLN-012-04 99411	5310-01-502-8371	NUT, SELF-LOCKING	5

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ITEM	PAGE	PARA-GRAPH	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)
	0007-3					*Figure 2, Item 9 should show a lockwasher. Currently shows a flat washer.*
	0018-2					*Cleaning and inspection, Step 6, reference to governor support pin (14) is wrong reference. Reference should be change to (12).*

SAMPLE

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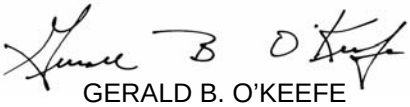
PART III – REMARKS *(Any general remarks, or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

By Order of the Secretary of the Army:

MARK A. MILLEY
General, United States Army
Chief of Staff

Official:



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THE METRIC SYSTEM AND EQUIVALENTS

Linear Measure

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

Weights

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Pounds
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

Liquid Measure

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

Square Measure

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
1 Sq Kilometer = 1,000,000 Sq Meters = 0.0386 Sq Miles

Cubic Measure

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

Temperature

9/5 C° +32 = F°
5/9 (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius

APPROXIMATE CONVERSION FACTORS

To Change	To	Multiply By
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Sq Inches	Sq Centimeters	6.451
Sq Feet	Sq Meters	0.093
Sq Yards	Sq Meters	0.836
Sq Miles	Sq Kilometers	2.590
Acres	Sq Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Sq Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

To Change	To	Multiply By
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Sq Centimeters	Sq Inches	0.155
Sq Meters	Sq Feet	10.764
Sq Meters	Sq Yards	1.196
Sq Kilometers	Sq Miles	0.386
Sq Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Sq Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621

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